The Quality of Corporate Environmental Reporting (CER): Theory and Practice

Eakpisankit, Araya

Award date:
2012

Awarding institution:
University of Bath

The Quality of Corporate Environmental Reporting (CER): Theory and Practice

Araya Eakpisankit

A thesis submitted for the degree of Doctor of Philosophy

University of Bath

School of Management

April 2012

Table of Contents

List of Figures

Figure

List of Tables

Table

Acknowledgements

First of all, my deepest gratitude goes to my supervisor, Dr Philip Cooper, for his supervision, encouragement and patience throughout the course of my PhD journey. Without his constant guidance, comments and support, this thesis would not have been possible.

I also acknowledge Professor Stephen Brammer and Mr Peter Vass, who served as the examiners at my transfer, for their comments and instructive input in the early stages of the thesis. Besides, I am grateful to Professor David Campbell and Professor John Forker who were examiners at my viva. Very special thanks to Mrs Christine Barnes and Mrs Suzanne Swallow for their helpful suggestions and kind assistance.

My personal thanks go to individuals who in many ways contributed to this thesis. On, Bow, Ang and Kati, thanks very much for being best friends I can always turn to and for supporting me no matter the circumstances are. Anne, I would like to express my big thanks to you for your kindness and touching support. I also owe many thanks to Max for his help and encouragement.

My greatest acknowledgement goes to my dearest family. Dad, Mum and Best, I cannot thank you enough for your love, for always believing in me and for being endlessly patient with me throughout the years of my stay away from home. Auntie Yin, Auntie Chai and the kids, I deeply appreciate your support and encouragement. Last but not least, Arm, I thank you for your continual and unconditional support throughout and for always standing by me. Without you, I would not have continued and finished this challenge.

Abstract

Due to the fact that corporate environmental reporting (CER) is largely voluntary and unregulated, practice has evolved in the absence of a meaningful conceptual framework. This lack of a normative theory stating what should be the content of CER as well as the methods for measuring reported information being largely volumetric or content based, is advanced as a major limitation in the existing literature. In this study, the well-established conceptual frameworks for financial reporting are adapted as the basis for a CER conceptual framework in which four characteristics of CER indicate its quality. Empirical methods for the measurement of such characteristics are also adapted from the financial reporting literature.

The main aim of this research is to use the adapted framework to examine the extent of variation in the quality of CER and then to test its applicability to the key motivational theories. The empirical work involves a panel of US and UK firms over a two-year period. This allows cross-sectional comparison to be made between different financial accounting regimes (rules- vs. principles-based) as well as permits examination of the development of CER over time. Further, the empirical work is extended to investigate the interrelationship between the financial and environmental performance of a firm.

Evidence in support of the legitimacy and institutional theory explanations for disclosure motivations is comprehensively found through the measures of the qualitative characteristics identified. That is, the use of a novel CER framework based on financial reporting quality here enables a more robust understanding of the reporting behaviours than previous work. Moreover, evidence for CER variation owing to the differences in financial reporting regimes is found and thus, it is reasonable to assert that the culture of financial reporting, to some extent, informs the nature of voluntary non-financial reporting. However, perhaps owing to the short time frame of the investigation, evidence of financial rewards from being environmentally effective or through providing CER is not found. The findings from this research will be of interest to preparers and users of corporate environmental reports as well as to policymakers, particularly in terms of enabling them to assess the quality of reporting and its level of fit with their expectations. Moreover, they also shed light on the link between environmental performance, as manifested in carbon emissions, and what is reported.

1 Introduction

1.1 Research Motivations

Corporate social responsibility (CSR), including the interaction of business with the natural environment, has become an increasingly important part of the business agenda over the past two decades (Mathews, 1997).[1] As emphasised in policymakers' reports, in reality, CSR actions have been identified as a 'business case', which may lead to significant business benefits as well as benefits for society and the environment. Moreover, the European Commission (2007a) has asserted that there is a link between CSR activities and business competitiveness. Similarly, the UK Department for Environment, Food and Rural Affairs (DEFRA) (2006) has claimed that managing and reporting on environmental performance may well benefit the firm, ranging from cost savings and productivity gains, improved sales, increased attractiveness to the investors, innovation in product and service development, exposure to fines reductions, relations with regulators improvement, to license to operate maintenance. Whilst public policy has involved some development of legal and regulatory requirements for environmental protection, such as the European Union (EU) Emissions Trading Scheme (ETS) (Directive 2003/87/EC, Directive 2004/101/EC, Directive 2008/101/EC, Directive 2009/29/EC), policy has largely relied on encouraging voluntary action by businesses.

[1] Current definitions of CSR emphasise its voluntary nature. For example, McWilliams and Siegel (2001, p.117) define CSR as

> "actions that appear to further some social good, beyond the interests of the firm and that which is required by law…Some examples of CSR actions include going beyond legal requirements in adopting progressive human resource management programs, developing non-animal testing procedures, recycling, abating pollution, supporting local businesses, and embodying products with social attributes or characteristics."

However, McWilliams and Siegel (2001, p.117) indicate that, on the one hand, a firm could react to stakeholder interest in CSR "in a very positive way, by devoting additional resources to promote CSR", whilst on the other hand it could abstain from CSR effort owing to the supposition that "such efforts are inconsistent with profit maximization and the interests of shareholders, whom they perceive to be the most important stakeholder."

CSR, then, has broad definitions and the differences in its definition are dependent upon the magnitude to which a firm extends its responsibilities beyond its main role as an economic entity, beyond obedience of the law, to include socially responsible acts involving ongoing interactions with the authorities and other public interests (Hemphill, 1997). In this thesis the definition of McWilliams and Siegel (2001) is adopted. That is, the scope of the analysis is limited to satisfying the increasing importance of environmental-related business agenda through CSR in relation to corporate responsibilities to the natural environment.

In this regard, the EU promotes corporate social (including environmental) responsibility at both the European and wider international level (European Commission, 2001, 2002, 2007a) and other supra-national bodies have similarly been active, e.g. the United Nations (UN) Global Compact (UN, 2010b), Organisation for Economic Co-Operation and Development (OECD) Guidelines for Multinational Enterprises (OECD, 2011) and the Global Reporting Initiative's (GRI) Sustainability Reporting Guidelines (GRI, 2000, 2002, 2006b, 2011).

With the increasing attention paid to social and environmental matters and corporate influence, there has been a growth in demand from multiple stakeholder groups, such as: consumers, investors, employees, creditors, legislators and regulators, on organisations to exercise and demonstrate their social and environmental responsibility (Gray et al., 1996). However, prior studies indicate that practices in demonstrating this responsibility come in "many different forms" (Perks, 1993, p.83) and vary either across firms by country or across countries or time (KPMG, 2005), because, as yet, there is limited compulsion (Matthews, 1993). In particular, in response to demands for environmental-related information, companies have reacted with a considerable upsurge in voluntary reporting on environmental issues through their traditional corporate publication channels, such as annual reports (Gray et al., 1995; Unerman, 2000). However, although there has been a dramatic increase in corporate reporting (Deegan, 2002), it has also been observed that it varies extensively from firm to firm and according to the period of time (Campbell, 2004). Further, this corporate environmental reporting (CER)[2] can embrace either voluntarily including environmental issues in annual reports and/or other forms of communication e.g. corporate web pages and press releases or, increasingly commonly for large organisations, producing stand-alone voluntary reports on environmental issues as environmental reports or inclusion in

[2] A number of authors have used "corporate social reporting" as the principal term for corporate social and environmental responsibility disclosure (e.g. Gray et al., 1995, p.68), which includes company information about: human resources, community involvement and environment. The term is defined by Gray et al. (1987, p.ix) as the:

> "…process of communicating the social and environmental effects of organizations' economic actions to particular interest groups within society and to society at large. As such, it involves extending the accountability of organizations (particularly companies), *beyond* the traditional role of providing a financial account to the owners of capital, in particular, shareholders. Such an extension is predicated upon the assumption that companies do have wider responsibilities than simply to make money for their shareholders."

In this research, attention is confined to reporting/disclosures related to the natural environment, which is referred to as corporate environmental reporting (CER).

wider CSR or sustainability reports (Tilt, 2008). However, in spite of laws and regulations, such as the US Securities and Exchange Commission (SEC) rules governing disclosure of environmental liabilities, in relation to Items 101, 103, 303 and 503(c) in SEC Regulation S-K (SEC, 2008), being introduced in recent years, a number of other aspects of environmental impacts are not priced, e.g. through taxes or permit trading, except for the carbon dioxide emissions of those industries and countries who joined the EU ETS (Directive 2003/87/EC, Directive 2004/101/EC, Directive 2008/101/EC, Directive 2009/29/EC) and hence, they are predominantly non-financial.

Owing to its non-financial disposition, CER is not covered by accounting standards and what is more, because the regulations are quite loose firms are free to disclose what they choose regarding most of its aspects. That is, even where such reporting is required or recommended, e.g. the Business Review in accordance with s.417 of the Act (Great Britain. *Companies Act 2006*) in the UK, it is not underpinned by a robust theoretical framework. In particular, as indicated above, although some reporting guidance is available, this is largely concerned with reporting content rather than quality. In this regard, much of the emerging literature investigating the patterns of and the motivations for voluntary environmental disclosures, examines the incidence of environmental disclosures in corporate annual reports and/or separate stand-alone environmental reports, by considering the content or volume of voluntary reporting, without paying substantial attention to its quality, such as the reliability or relevance of the disclosures (e.g. Adams and Kuasirikun, 2000; Campbell, 2004; Gamble et al., 1996; Gray et al., 1995, 2001; Guthrie and Parker, 1989; Patten, 1992; Zeghal and Ahmed, 1990). Therefore, there is increasing doubt and scepticism about whether credible information is presented to an organisation's shareholders and the wider society actors through the voluntary environmental reports (Cooper and Owen, 2007), i.e. whether it truly constitutes corporate accountability. This has generated considerable questions about how companies should demonstrate their environmental responsibility and about what constitutes best practice in environmental reporting as well as what is appropriate content.

Owing to a lack of a precise normative theory for CER, the study of what its content should be and how its quality should be assessed can be regarded as being in its infancy. In this regard, in the early 1980s, the studies of Wiseman (1982) introduced the notion

that the quality of the CER should be the main concern rather than reported volumes. Subsequently, other researchers identified a set of indicators or key terms that they believed CER quality should engender, e.g. Al-Tuwaijri et al. (2004), Brammer and Pavelin (2006a, 2006b), Cho and Patten (2007), Clarkson et al. (2008), Cormier et al. (2005), Ho and Taylor (2007), van der Laan Smith et al. (2005), but they failed to link these measures with consistent qualitative concepts. That is, although they highlighted the need for credibility, relevance and usefulness for decision-making regarding information reporting, they did not devise an underlying framework for the disclosure quality. In addition, their emphasis on disclosure content raises the issue of the fairness of information scoring (Beattie et al., 2004; Brammer and Pavelin, 2006a) and what is more, they did not take into account the different environmental impact across industry sectors.

Similarly, a number of benchmarking surveys that examined environmental disclosures, such as Business in the Environment (BiE) (BiE, 2000, 2002, 2003; Business in the Community (BiC), 2004), Oxford Economic Research Associates (OXERA) Environmental Ltd. (2000) and some reporting awards, such as the Association of Chartered Certified Accountants (ACCA) UK Environmental Reporting Awards (ERA) Scheme (ACCA, 1999) and ACCA UK Awards for Sustainability Reporting (ACCA, 2005, 2007), employed methods dealing with content rather than quality, in spite of their claiming to focus on the latter. Moreover, the aforementioned standards and guidelines suggested by the GRI (GRI, 2000, 2002, 2006b) are mainly concerned with disclosure content regarding the assessment of CER quality. Further, although the GRI Guidelines have been adopted as measures of disclosure in a few studies (e.g. Clarkson et al., 2008; Ho and Taylor, 2007), these researchers only followed the general early version of 2002, hence failing to distinguish between different industrial sectors. With respect to this, the GRI Sector Supplements (GRI, 2003, 2005a, 2005b, 2006a, 2007, 2008a, 2008b) and the indicators of DEFRA (2006) did introduce industry specific measures, but they were largely reliant on disclosure content, as with the earlier GRI formats. Nevertheless, as far as this researcher is aware, there has been no study that has used these guidelines to analyse CER in relation to different business activities.

In this thesis, CER is measured using a comprehensive approach that captures the quality of disclosure rather than its content or quantity. That is, the framework for this

research draws upon the qualitative aspects of both well-established financial reporting frameworks as well as non-financial information, as proposed by the GRI (2006b) and because the emphasis is on information quality this work contributes new knowledge to the existing literature that for the most part has focussed on content.

In general, it is the limitations of the previous empirical work and reporting frameworks that motivates the research objective for this thesis. That is to say, whether financial reporting can inform voluntary CER, in other words, whether a CER framework derived from the financial reporting frameworks, i.e. defined by the characteristics of decision-useful information, is valid and superior to a purely reporter-defined approach to CER and those treatments used in prior studies, is the main motivation for this research. To investigate this, empirical testing of whether the identified measures of these characteristics lead to better understanding of reporting behaviour, based on existing theories, is to be carried out. To guide this endeavour, the main research questions are constructed as:

- To what extent do the current practices of CER meet the concrete qualitative characteristics of: understandability, relevance, reliability and comparability and consistency?
- What are the factors affecting a firm's decision-making in relation to environmental disclosure?
- Regarding each of these factors, what is their level of influence on the qualitative characteristics of CER?

In previous studies on the motivation for disclosure, in spite of their being no conclusive results, firm performance regarding financial and environmental activities have both been suggested as being significant factors (Al-Tuwaijri et al., 2004; Clarkson et al., 2008; Cormier and Magnan, 1999; Roberts, 1992). Moreover, it has been posited that there is a relationship between the financial and environmental performance of a firm, but this has yet to be empirically proven or refuted (McWilliams and Siegel, 2001). Further, there has been an ongoing debate about the nature of this relationship, with on the one hand, those proposing the resource availability justification, whereby affluent firms are more likely participate in environmental activism, thus showing they have made a link between environmental and financial performance (Ullmann, 1985).

Similarly, Waddock and Graves (1997) found a positive relationship between financial and environmental performance. On the other hand, others have expressed the belief that the relationship between the two is positive owing to the stakeholders' financially beneficial response to a firm's environmental efficiencies (Hart and Ahuja, 1996; Orlitzky et al., 2003). Both notions, especially the latter as it relates to outcomes of the disclosure influences, hence, inspire one of this researcher's further objectives, that of investigating the interrelationship between the financial and environmental performance of a firm.

1.2 Nature of this Research

A critical element of this study involves viewing the 'quality of CER' through the lens of quality as defined in financial reporting frameworks. More specifically, the key concept of usefulness for decision-making of a firm's disclosed information is employed to underpin the overall framework for this research endeavour. That is, in the absence of unambiguous normative theory for CER, these well-established financial reporting frameworks, which state what companies should report based on the decision usefulness concept, are adapted to generate such theory regarding environmental reporting quality. Three frameworks are drawn upon in the initial theoretical part of this thesis that highlight the fundamental qualitative characteristics of financial reporting, these being those of: the UK Accounting Standards Board (ASB) (1999), the US Financial Accounting Standards Board (FASB) (1980) and the International Accounting Standards Board (IASB) (2001) and these are subsequently transformed into non-financial environmental disclosure criteria. In addition to this, the GRI Guidelines (GRI, 2006b) are engaged with to identify which of and how these financial aspects can be translated into non-financial components. Further, having established the categories of: understandability, relevance, reliability and comparability and consistency as the measures of quality of environmental reporting, the guidelines are used to unpack the details of each of these characteristics. Under this lens, the term 'CER quality' employed in this research is somewhat different from previous work in this field in that the latter has invariably focussed on the content of disclosed information.

Having established what constitutes disclosure quality in this research and the nature of the framework to be employed, empirical measures derived from this are used for the following analyses aimed at testing the framework's validity.

1.2.1 Determinants of Environmental Reporting Variation

Testing the Motivational Theories

The results of the variations in the quality of voluntary environmental disclosures are used to investigate the validity of the three main theories advanced to explain motivations for and the content of CER practice, namely the: legitimacy, stakeholder and institutional theories. In particular, when the prior literature is reviewed, it emerges that several studies have indicated that: size, industry, country of origin and business financial performance (e.g. profitability), can influence the variation of corporate behaviour in environmental disclosure and so the aim is to determine whether the quality of environmental reporting can be shown to be associated with such variables.

Relation between Environmental Performance and Environmental Reporting

In addition to the current research on environmental disclosure, the analysis takes account of the relationship between environmental reporting quality and environmental performance, as manifested in carbon emissions. As such, the environmental performance measure used differs from those employed in previous research and hence also makes a contribution to the extant literature. Moreover, this prior research did not employ quality as the aspect of reporting.

Relation between Financial Accounting Regime and Environmental Reporting

In response to the underlying motivation of seeing if financial reporting can inform voluntary CER, the empirical work involves drawing on a panel of US and UK companies, thereby adding to the debate about which system better supports the

voluntary disclosure between different financial accounting regimes (rules- vs. principles-based) (Beattie and McInnes, 2006).

Relation between Additional Experimental Variables and Environmental Reporting

As a significant number of firms, nowadays, use the GRI Guidelines to prepare their environment reports, it seems reasonable to evaluate the quality of this reporting through this tool and hence, this action is undertaken. In addition, the measures of CER quality are compared with other ratings of environmental/sustainability issues, the FTSE4Good and Dow Jones Sustainability Index (DJSI), to investigate if a firm's environmental responsiveness provided by such external organisations affects the decision to disclose and thus verify or bring into question whether the ratings are helpful for the relevant users' decision-making. Both such endeavours have not been previously empirically addressed using robust measures of quality as the dependent variables. Moreover, prior studies have largely focussed on firm-specific factors and environmental performance on disclosures.

1.2.2 Testing Mimetic and Coercive Reporting Behaviours: the Institutional Theory Perspective

To increase confidence in the cross-sectional findings and to test the mimetic and coercive behaviours hypothesised by institutional theory and inspired by Cormier et al.'s (2005) empirical work, this researcher seeks to identify any trends in the quality of CER over time.

1.2.3 Interrelation between Financial and Environmental Performance

Lastly, so as to address the issue of reporting motivations, an investigation into the nature of the relation between financial and environmental performance is conducted, which involves, first establishing the direction of correlation, if any. Following this,

further analysis on the effects of environmental performance and disclosures in terms of quality on the subsequent year's financial performance is carried out using regression. In other words, the main aim is to find any evidence that these latter two variables can have an impact on firm financial performance and hence, should receive greater attention than at present.

In sum, in order to investigate all these matters, first, a theoretical study is undertaken to provide the framework for measuring the disclosure quality in the subsequent empirical investigation. Moreover, the factors influencing this quality are elicited at this primary stage. The empirical work involves testing all of the issues raised in the three subheadings of this section.

1.3 Research Originality

This research addresses the limitations of previous research into social and/or environmental reporting, in particular, in relation to the methods employed when analysing the disclosure. That is, previous work, as pointed out above, although identifying what has been termed quality factors, has, in this researcher's view, focused on content rather than quality. Consequently, in this thesis a new method for measuring a firm's environmental disclosure quality is introduced, involving the development of a CER quality framework. The main hypotheses pertaining to firm specific characteristics may be drawn from previous literature to evaluate motivational theories, yet the novelty lies in the use of this framework to achieve this goal.

In addition, the sample used is original in that it is both cross-sectional and covers more than one year. That is, panel data from two countries, the UK and the US, for a period of two years from 2005 to 2006, is drawn upon to compare the quality of environmental disclosures from different reporting regimes. Although this has been called for in the financial reporting literature (Beattie and McInnes, 2006), there have been few studies paying attention to the non-financial aspects of this issue in any context (see for example Adams and Kuasirikun, 2000; Gamble et al., 1996) and, as far as this researcher is aware, there is no research that analyses this issue by comparing the UK with the US. Moreover, in spite of the period of time covered in the sample being

shorter than in some previous studies, the decision was taken to place the main emphasis on the cross-sectional analysis rather than longitudinal depth, given the limits on time. The concise two-year period of the sample; however, is used to examine behaviours of leader and follower firms' environmental disclosure. That is, inspired by Cormier et al.'s (2005) testing of the underpinning tenets of institutional theory, the aim here is to do likewise using an original approach.

Moreover, an additional experimental variable, the GRI Guidelines usage, which is hypothesised as influencing CER variation, is also a novel introduction to the exploration of environmental disclosure. Furthermore, some of the analysis involves using measures of environmental performance distinct from those employed by previous studies, as explained in chapters 2 and 4.

1.4 Structure of the Thesis

The remainder of the thesis is structured as follows. Chapter 2 reviews the literature pertaining to the research area. Firstly, in this chapter, there is an outline of prior literature dealing with the various measurement methods used to examine environmental disclosure, so as to provide a general background. Secondly, a detailed discussion of the ways in which such measures for disclosure have been employed in the literature is presented. This section is divided into four subsections, dealing respectively with the: disclosure variation, motivational theories for voluntary environmental reporting, the relationship between disclosure and performance and the value-relevance of the disclosure. These subsections, in particular the second, not only contain reviews of the theoretical arguments regarding CER drivers, but they also provide related empirical evidence on the interaction between environmental disclosure and these drivers. These subsections also contain a brief review of the methods that have been previously adopted in empirical studies for: exploring disclosure variation, testing the motivational theories, examining the link between disclosure and performance and investigating the disclosure value-relevance. In addition in the chapter, the limitations of the existing empirical studies in relation to the quality of environmental reporting and other empirical matters, are identified, which are

subsequently borne in mind when constructing the CER framework, choosing the sample and when deciding upon the proxy to be used for environmental performance.

In chapter 3, the framework in relation to the environmental disclosure quality and the hypotheses to be tested aimed at fulfilling the two central goals of this thesis, namely, the explanation of its variation and the value-relevance of this, are developed. Regarding these goals, the former activity is theoretical in nature, whereas the latter refers to the subsequent empirical investigation involving the testing of this framework. In relation to the first, the well-established financial reporting frameworks are compared with the non-financial reporting guidelines in the GRI (2006b), so as to operationalise the notion of quality in environmental disclosure. That is, the commonalities, close approximations and differences between the two are identified so as to provide justification for adapting the financial decision usefulness characteristics for application to the newly devised disclosure framework for this study. This will provide a more extensive and precise set of quality measures than were the GRI Guidelines only to be used to assess the quality of disclosures. Regarding the qualitative characteristics of the CER framework, the quality of environmental disclosure is represented by four core components: understandability, relevance, reliability and comparability and consistency. The main hypotheses, taking CER quality as the dependent variable, are aimed at evaluating the influence of a set of factors that have been identified as being significant in relation to environmental disclosure in the extant literature as well as other variables deemed to have salience by this researcher. The hypotheses development is subsequently expanded to incorporate imitation and routine forces under institutional theory, in accordance with the notion of these institutional drivers as employed in Cormier et al.'s (2005) study. Finally, the interrelation between financial and environmental performance is modelled to: test the financial resource availability perspective put forward by Ullmann (1985) and Waddock and Graves (1997) as well as to investigate whether there are any monetary incentives from being environmentally efficient and/or financial rewards through providing environmental information. That is, the aim here is to establish whether or not there is a link between disclosure quality and subsequent financial performance and/or one between environmental performance and the latter. Throughout this chapter, where appropriate during the framework building, the research questions and hypotheses are developed to guide the research process.

Chapter 4 commences with a summary of the hypotheses for the empirical investigation established in the previous chapter. A description of the data and variables included in the empirical estimation is then provided. Regarding this, inspired by the disclosure measurement methods used in empirical financial reporting studies and the existing limitations in the previous literature, proxies for the quality of environmental disclosure are developed. In addition, there is a review of the measures of the factors included in the hypotheses: firm-specific determinants of CER quality, environmental performance, accounting system, GRI Guidelines application information, independent environmental ratings and reporting year. The estimation strategy adopted for the subsequent empirical work comprises: an investigation of the determinants of variation in CER quality, an examination of behaviours per institutional theory and scrutiny of the financial-environmental performance interrelation, the results of which are to be found in the next chapter.

In chapter 5, results and analysis of the empirical investigation are presented for the three analytic methods. Regarding the first, the linear (and nonlinear for the comparability and consistency qualitative component) effects of plausible determinants on environmental disclosure quality are scrutinised. In the second empirical investigation, the mean values of the difference in the quality of environmental reporting across the two-year period and the variance in the residuals captured from year-specific regressions, are examined. Finally, the relation between financial and environmental performance is computed, in particular, in order to establish whether high quality reporting and effective environmental performance can accrue financial rewards. The statistical software package used is STATA version 11.

Chapter 6 contains a discussion on the outcomes of the empirical investigation including consideration of the thesis's empirical findings along with the theoretical implications as regards to the three empirical studies. For each empirical study, the hypotheses are considered in turn, and some conclusions are drawn. With regards to this, the stakeholder, legitimacy and institutional theories are employed, in turn, to help interpret different aspects of the findings as well as to identify the ways in which these perspectives are mutually connected. In addition, the results regarding the nature of the relationship between financial and environmental performance, with the emphasis being

on the impact of the latter and/or the disclosure on short-term financial performance, are evaluated.

Chapter 7, the final chapter, contains a brief review of the findings and this is followed by a summary of the theoretical and empirical contributions, which include those to the: academic literature, environmental reporting policy makers, reporting preparers and to the users. The chapter concludes with a discussion on the limitations of the research and proposals for avenues for future investigation.

2 Literature Review

Gray et al. (1987) defined social reporting as an extension of corporate traditional presentation of financial accounts, based on the assumption that firms have wider responsibilities than only to the shareholders and one subset of this is environmental reporting. Regarding this, it is fundamental for a firm to find a particular combination of environmental information that maximises its overall advantage and best appeals to both its shareholders and other stakeholders, that is, the issue arises as to the optimal mixture of environmental information disclosure.

In relation to the literature on CER, some has investigated its motivating factors and consequently its variation, whilst another body has focussed on its value-relevance and a further group has studied the relation between environmental performance and CER. However, with there being no uniformity in CER, previously, researchers have largely analysed a firm's environmental disclosure and evaluated their practices by implementing volume-based measures devoted to environmental information (e.g. word, line, or sentence count; page length; etc.), under the assumption that high volume implies a high level of disclosure. In addition to this, since Wiseman (1982) and Guthrie and Parker's (1990) seminal work, researchers have increasingly recognised the importance of the qualitative description of the communication content of social and/or environmental disclosures. Nevertheless, their measures have relied heavily on the extent of the disclosed information, i.e. on the coverage of information items related to a firm's activities for specific social and/or environmental involvement, by either identifying where an attribute is present or not or through a ranked scale. A number of more recent research endeavours have attempted to use more complicated instruments that take into account such issues as: numerical data, monetary terms, past performance, targets, performance against targets and performance against competitors (e.g. Al-Tuwaijri et al., 2004; Brammer and Pavelin, 2006a; Cormier et al., 2005; Ho and Taylor, 2007). Nevertheless, in spite of these researchers having claimed to measure the quality of disclosures, in reality they have focussed on content rather than identifying concrete qualitative concepts and this gap in the literature provides the motivation for the investigation carried out in this thesis.

To introduce an overall view of the literature, a summary table that categorises prior studies by type of measures and subject matter, is provided in table 2.1. This chapter is then organised as follows. In section 2.1, a review of the measures used in the literature into CER is presented and then the way in which these measures have been employed is reviewed in section 2.2. This section is divided into four subsections and it includes consideration of works on: explaining disclosure variation in the first, 2.2.1, testing motivational theories in the second, 2.2.2, examining the relationship with environmental performance in the third, 2.2.3 and the value-relevance of the disclosed information in the fourth, 2.2.4. Section 2.3 probes the limitations of prior studies, especially in relation to the lack of a theoretical framework of environmental information disclosure as well as examining their empirical shortcomings. Section 2.4 contains a brief discussion on how the identified gaps in the literature are to be addressed in this research, in particular, the way in which the conceptual framework to be applied is to be constructed.

Table 2.1: A Summary Table of Prior Studies

Measure of Disclosure	Subject Matter	Authors and Details of Metrics or Additional Metrics
Volume Based		
Number of words	Environmental disclosure as a means of legitimising corporations	Campbell, 2003
	Environmental disclosure practices in the UK – a longitudinal and cross-sectional analysis from a legitimacy theory perspective	Campbell, 2004
	Environmental disclosure practices in Australia – changes across time and relation to industry sensitivity and firm size from a legitimacy theory perspective	Deegan and Gordon, 1996
	Analysis of environmental disclosures by firms prosecuted successfully by the Environmental Protection Authority	Deegan and Rankin, 1996 (plus number of pages and proportion of pages for the robustness check)
	The influence of external pressure on environmental disclosures, the characteristics of environmental disclosure, the association between environmental disclosures and performance	Neu et al., 1998
	Differences in social (and environmental) disclosures internationally through the stakeholder perspective: the US vs. Norway/Denmark	van der Laan Smith et al., 2005 (plus number of sentences, proportion of pages and an extent of information content based measure – presence of numeric data through a dichotomous index)
	Association between environmental reporting practices and influence on the decision to disclose – a survey	Wilmshurst and Frost, 2000
	Social (and environmental) reporting practices in the annual report, brochures and advertising in Canada	Zeghal and Ahmed, 1990
Number of sentences	Environmental performance and legislation and environmental performance and disclosure – a case study	Buhr, 1998
	Determinants of social and environmental disclosures in New Zealand companies – relationship between the disclosure and size, industry and profitability	Hackston and Milne, 1996
	Environmental reputation management through disclosures	Hasseldine et al., 2005 (plus an extent of information content based measure – an ordinal disclosure index)
	Environmental reporting practices in the UK and the US in relation to the regulatory context	Holland and Boon Foo, 2003

Table 2.1: A Summary Table of Prior Studies (continued)

Measure of Disclosure	Subject Matter	Authors and Details of Metrics or Additional Metrics
	External ratings vs. quality and information content of environmental disclosures	van Staden and Hooks, 2007 (plus extent of information content based measures – a dichotomous disclosure index and an ordinal disclosure index)
	Relationship between environmental disclosures and public policy pressure from a legitimacy theory perspective	Walden and Schwartz, 1997 (plus number of lines and an extent of information content based measure – dichotomous disclosure indices within categories)
	Corporate social (and environmental) disclosure practices on web sites and international comparison	Williams and Pei, 1999 (plus an extent of information content based measure – an ordinal disclosure index)
Number of pages	Comparative analysis of corporate social and environmental reporting between the UK and German and factors influencing the variation related to social and political pressures – a longitudinal study	Adams and Kuasirikun, 2000 (plus the proportion of pages)
	Social (and environmental) reporting practices – an international perspective in relation to size, industry membership and country of domicile through a legitimacy theory perspective	Adams et al., 1998 (plus the proportion of pages and an extent of information content based measure – dichotomous disclosure indices within categories)
	Relationship between social (and environmental) disclosure and: public pressure and profitability	Patten, 1991
	Environmental disclosures in response to certain incidents occurring within the industry within a particular year and its relationship with size and ownership – from a legitimacy theory perspective	Patten, 1992 (plus proportion of pages for the robustness check)
	Variation in social (and environmental) reporting practices through a legitimacy theory perspective	Patten, 1995 (plus an extent of information content based measure – dichotomous disclosure indices within categories)
Number of lines	Relationship between environmental disclosure and environmental performance	Patten, 2002a (plus an extent of information content based measure – a dichotomous disclosure index)
	Relationship between environmental disclosure and environmental performance	Wiseman, 1982 (plus an extent of information content based measure – an ordinal disclosure index)

Table 2.1: A Summary Table of Prior Studies (continued)

Measure of Disclosure	Subject Matter	Authors and Details of Metrics or Additional Metrics
Frequency of word occurrence	Environmental disclosure practices in the US and the relationship between the disclosure and performance – a cross-sectional analysis	Cho et al., 2010
Proportion of pages	Describe social and environmental reporting within the UK	Gray et al., 1995
	Relationship between environmental disclosure and corporate characteristics in the UK – a cross-sectional and longitudinal study	Gray et al., 2001 (through the external rating – The Centre for Social and Environmental Accounting Research (CSEAR))
	Historical analysis of the social (and environmental) disclosure pattern – a longitudinal study	Guthrie and Parker, 1989
	Disclosure practices of perceived good reporters in the UK	Harte and Owen, 1991 (plus an extent of information content based measure – a dichotomous disclosure index)
	Reporting practices in a broad range of corporate reports – a longitudinal case study	Unerman, 2000
Extent of Information Content Based		
Coverage of Issues		
Ranking a number of aspects/categories of voluntary disclosure	Relationship between social (and environmental) disclosure and social (and environmental) performance and market-based financial performance	Belkaoui and Karpik, 1989
	Relationship between the UK environmental disclosure and firm and industry characteristics, e.g. size, sector, financial leverage, environmental impact and ownership dispersion	Brammer and Pavelin, 2006b (through an external rating – the PIRC Environmental Reporting 2000 Survey)
Dichotomous disclosure index[(b)] (incidence/no incidence) through the disclosure contents	Benchmark companies performance against their peers and industries against each other, on the basis of their environmental management and performance in key impact areas	BiE, 2000, 2002, 2003; BiC, 2004
	Environmental disclosure practices from an international perspective (the US vs. Canada) and the role of cultural and	Buhr and Freedman, 2001 – presence or absence of such factors as: quantitative measures, targets, initiatives, etc. are scored as

Table 2.1: A Summary Table of Prior Studies (continued)

Measure of Disclosure	Subject Matter	Authors and Details of Metrics or Additional Metrics
	institutional factors on a longitudinal basis	appropriate for each issue in the contents of the disclosure
	Environmental reporting practices on the internet	Cho and Roberts, 2010 – presence or absence of: monetary terms, targets, policies, initiatives, etc. for each issue in the list of contents as appropriate. Plus presence or absence of illustrations to support the disclosure
	Relationship between environmental disclosure and environmental performance	Clarkson et al., 2008 (plus an ordinal disclosure index – with presence or absence of such factors as: quantitative (numeric), policies, initiatives, etc. being scored as required for each of the issues in the contents)
	Environmental disclosure practices from an international perspective	Gamble et al., 1996
	Environmental disclosure practices from an international perspective	Guthrie and Parker, 1990 – presence or absence for a range of issues plus whether they are expressed in: monetary, non-monetary or declarative terms (plus a volume based measure – proportion of pages)
	Social and environmental reporting and its determinants (size, profitability, liquidity, industry membership) for the US and Japan	Ho and Taylor, 2007 – presence or absence of the following: quantitative (numeric), quantitative (numeric), absolute and normalised form, policies, initiatives, targets, etc. as appropriate for each issue in the list of contents
	Environmental reporting practices of global corporations based on website disclosures	Jose and Lee, 2006
	International survey of corporate responsibility reporting	KPMG, 2005
	Environmental reporting practices by Australian state government departments	Lynch, 2010 – presence or absence of: quantitative (numeric) terms, targets, etc. as appropriate for a range of issues in the disclosure
	Relationship between environmental disclosure and environmental performance	Patten, 2002a (plus a volume based measure – the number of lines)
	Environmental disclosure and extensive media coverage	Patten, 2002b
	Voluntary reporting practices of the Australian mining industry	Yongvanich and Guthrie, 2005

Table 2.1: A Summary Table of Prior Studies (continued)

Measure of Disclosure	Subject Matter	Authors and Details of Metrics or Additional Metrics
Representation		
Dichotomous disclosure index[(b)]		
Dichotomous disclosure index (incidence/no incidence) through the disclosure contents	Findings and reflections of the judging panel for the UK Awards for Sustainability Reporting	ACCA, 1999, 2005 – presence or absence of the following: absolute, normalised, comparative with trends over time and within sector, policies, targets, etc. for each issue in the list of contents as appropriate
	Sustainability reporting guidelines	GRI, 2006b[(a)] – presence or absence of: quantitative (numeric), quantitative (numeric) absolute and normalised form, policies, initiatives, targets, etc. for each issue in the list of contents as appropriate
Incidence/non-incidence of: group-wide environmental policy, environmental initiatives, improvement in key areas of environmental performance, environmental audit and target-setting	Factors influencing the quality of corporate environmental disclosure – relationship between the disclosure and firm and industry characteristics	Brammer and Pavelin, 2006a
Presence or absence of quantitative (numeric) terms in the disclosure contents	Differences in social (and environmental) disclosures internationally from a stakeholder perspective: the US vs. Norway/Denmark	van der Laan Smith et al., 2005 (plus volume based measures – number of words, number of sentences and proportion of pages)
Dichotomous disclosure indices[(c)]		
Presence or absence of a range of issues in the reporting and whether or not they are in quantitative terms	Social (and environmental) reporting practices – an international perspective in relation to size, industry membership and country of domicile from a legitimacy theory perspective	Adams et al., 1998 (plus volume based measures – the number and proportion of pages)
Presence or absence of a range of issues in the	Relationship between environmental disclosure and environmental	Cho and Patten, 2007

Table 2.1: A Summary Table of Prior Studies (continued)

Measure of Disclosure	Subject Matter	Authors and Details of Metrics or Additional Metrics
reporting and whether or not they are in monetary terms.	performance	
Presence or absence of a range of issues in the reporting and whether or not they are in financial terms.	Disclosure practices of perceived good reporters in the UK	Harte and Owen, 1991 (plus a volume based measure – the proportion of pages)
Presence or absence of a range of issues and whether or not they are reported in: quantitative (numeric) and/or monetary terms	Variation in social (and environmental) reporting practices from a legitimacy theory perspective	Patten, 1995 (plus a volume based measure – the number of pages)
1. Presence or absence of: quantitative (numeric) terms for a range of issues in the disclosure 2. Presence or absence for a set of issues in the reported contents in: quantitative (numeric) terms, in absolute and normalised forms 3. Presence or absence in quantitative (numeric) normalised terms in the disclosed contents set against target for the aforementioned issues	Environmental reporting guidelines for UK businesses	DEFRA, 2006[(a)]
Presence or absence of a range of issues and whether or not they are reported in: quantitative (numeric) and normalised forms as well as whether or not: policies, plans, targets and/or progress to date are contained within the disclosure	Analysis of the quality of reporting within the FTSE100 and 250	OXERA Environmental Ltd., 2000
Presence or absence of a range of issues and whether or not they are reported in quantified	Relationship between environmental disclosures and public policy pressure from a legitimacy theory perspective	Walden and Schwartz, 1997 (plus volume based measures – number of sentences and number of lines)

Table 2.1: A Summary Table of Prior Studies (continued)

Measure of Disclosure	Subject Matter	Authors and Details of Metrics or Additional Metrics
terms as well as whether or not there is specificity and/or a time frame in the contents		
Ordinal disclosure index[(d)]		
Ordinal ranking, ranging from highest to lowest: monetary/quantitative (numeric), specifically non-quantitative descriptive, non-specific qualitative and no disclosure for each issue in the contents	Relationship between environmental disclosure and environmental performance and between financial performance and environmental performance	Al-Tuwajri et al., 2004
	Relationship between company disclosure, size and ownership	Cormier and Gordon, 2001
	Determinants of corporate environmental reporting by Canadian firms – information costs, financial condition, size, regulatory regime and industry	Cormier and Magnan, 1999
	Determinants of corporate environmental reporting from an international perspective – size, proprietary costs, information costs, media visibility and industry-specific	Cormier and Magnan, 2003
	Determinants of corporate environmental disclosure using a multi-theoretical lens – economic incentives, public pressures and institutional theory	Cormier et al., 2005
	Relationship between environmental disclosure and environmental performance	Freedman and Wasley, 1990
	Relationship between environmental disclosure and environmental performance	Wiseman, 1982 (plus a volume based measure – the number of lines)
Ordinal ranking, ranging from highest to lowest: quantitative (numeric), specific qualitative and year comparison, quantitative (numeric) and specific qualitative, quantitative (numeric), specific qualitative, non-specific	Environmental information diversity between the UK and Germany over a period of five years	Beck et al., 2010

Table 2.1: A Summary Table of Prior Studies (continued)

Measure of Disclosure	Subject Matter	Authors and Details of Metrics or Additional Metrics
qualitative and no disclosure for the issues in the disclosed contents		
Ordinal ranking of information in the disclosed contents, ranging from highest to lowest: disaggregated level, absolute and normalised form, relative to targets, relative to previous periods, relative to industry competitors and simple presentation	Relationship between environmental disclosure and environmental performance	Clarkson et al., 2008 (plus a dichotomous disclosure index)
Ordinal ranking, ranging from highest to lowest: monetary/quantitative (numeric), specifically non-quantitative descriptive, non-specific qualitative, immaterial qualitative and no disclosure for the issues in the reported contents	Relationship between environmental disclosure and environmental performance	Hughes et al., 2001
Ordinal ranking, ranging from highest to lowest: implementation and monitoring, use of targets, numeric results; implementation and monitoring, use of targets; specific endeavour, policy specified; specific endeavour, policy only; general rhetoric and no disclosure for a range of issues in the disclosed contents	Environmental reputation management through disclosures	Hasseldine et al., 2005 (plus a volume based measure – number of sentences)
	Environmental reputation through disclosure quality	Toms, 2002
Ordinal ranking, ranging from highest to lowest: benchmarking against best practice, quantitative/monetary, qualitative and policies, non-specific qualitative and no disclosure for a	External ratings vs. quality and information content of environmental disclosures	van Staden and Hooks, 2007 (plus a dichotomous index and a volume based measure – the number of sentences)

Table 2.1: A Summary Table of Prior Studies (continued)

Measure of Disclosure	Subject Matter	Authors and Details of Metrics or Additional Metrics
range of issues in the disclosed contents		
Scores of: excellent, good, poor and not present for a joined-up approach, reward, recognise and discipline (the bottom line), not just good news,learning and improvement and the historical perspective	Findings and reflections of the judging panel for the UK Awards for Sustainability Reporting	ACCA, 2007
Ranking in terms of quality regarding a range of issues in the disclosed contents using scales with differing ranges	Relationship between financial disclosure and social disclosure and the cost of equity capital – value-relevance of disclosure studies	Richardson and Welker, 2001 (through the external rating – the joint Society of Management Accountants of Canada (SMAC)/University of Quebec at Montreal (UQAM))
Scores of: excellent, good, poor and not present for a range of issues in the disclosed contents	Determinants of corporate social and environmental disclosure based on a stakeholder theory of strategic management	Roberts, 1992 (through an external rating – the Council on Economic Priorities (CEP))

(a) These two studies were not empirical, but they are included because they contain protocols that reflect those investigated in much of the empirical research, although in the case of DEFRA (2006) this has not been used previously in the practical sense
(b) Dichotomous disclosure index: Assigning a numerical score based on the incidence (presence or absence) of information items within the categories of the contents
(c) Dichotomous disclosure indices: Assigning a numerical score based on the incidence (presence or absence) of information items within the categories of contents, by referring to more than one index
(d) Ordinal disclosure index: Assigning a numerical score with a weighted allocation to different disclosure items within the categories of the contents, based on the perceived importance of each item to various user groups

2.1 The Measures Used in Research into CER

2.1.1 Volume-Based Measures

Because CER is largely voluntary, a substantial body of the literature regarding it has been concerned with identifying and measuring what is being disclosed in corporate annual reports, in terms of volume, either across companies or across time, using content analysis[3] (e.g. Adams and Kuasirikun, 2000; Campbell, 2003, 2004; Cho et al., 2010; Deegan and Gordon, 1996; Gray et al., 1995, 2001; Hackston and Milne, 1996; Holland and Boon Foo, 2003; Neu et al., 1998; O'Donovan, 2002; Zeghal and Ahmed, 1990). These researchers have all worked under the assumption that the amount of a disclosure indicates the significance of it to the reporting organisation (Unerman, 2000) and the units of analysis have included: words, sentences, lines, pages, proportion of pages and frequency of word occurrence. In general, the predetermined categories relating to the disclosure content rely on the predilection of the researcher and hence, can be criticised as having been somewhat subjective. Moreover, this extant research has nearly all been focussed on descriptive studies of CER volume incidence rather than being concerned with identifying desirable content. That is, being of this form they have only reported what volume currently exists and thus, have not provided a meaningful understanding of the type and importance of the information being disclosed (van der Laan Smith et al., 2005), paying little attention to the information quality, such as its: relevance, credibility, accuracy, etc. Finally, the reliability in scoring using a particular classification of CER disclosures with content analysis is questionable, because this is likely to vary from person to person, for as yet, no robust standard procedure has been devised (Milne and Adler, 1999).

2.1.2 Extent of Information Content-Based Measures

[3] Content analysis is defined by Abbot and Monsen (1979, p.504) as:

> "a technique for gathering data that consists of codifying qualitative information in anecdotal and literary form into categories in order to derive quantitative scales of varying levels of complexity".

Coverage of Environmental Issues

Instead of volume, Belkaoui and Karpik (1989) measured the extent of disclosure information by counting the number of social/environmental items a firm disclosed using a set of appropriate issues taken from a previous study. That is, they used this item categorisation to devise a scale for assessing a firm's level of disclosure, which had an integer range from zero to 13. A more recent study by Brammer and Pavelin (2006b) relied on the same technique for measuring the disclosure level. Widely cited studies by Guthrie and Parker (1990) and Gamble et al. (1996) also considered coverage, but their method involved seeking the presence or absence of the chosen criteria and subsequently, assigning an overall score. Moreover, these authors claimed that using their approach resulted in capturing the quality of the information disclosure, rather than its volume. A number of later studies recognised the notion of the disclosure quality and have applied this perspective to its measurement (e.g. Adams et al., 1998; Buhr and Freedman, 2001; Cho and Patten, 2007; Cho and Roberts, 2010; Clarkson et al., 2008; Ho and Taylor, 2007; Patten, 2002a, 2002b; Yongvanich and Guthrie, 2005). Moreover, with the exception of Buhr and Freedman (2001), Cho and Patten (2007), Cho and Roberts (2010) and Patten's (2002a) work, the items included in the disclosure index were drawn from the GRI Guidelines, in particular, those published in 2002 (GRI, 2002). Nevertheless, despite this, nearly all of these empirical efforts arrived at a different set of items for the social/environmental disclosure assessment. However, some of these items pertained to issues regarding whether or not a particular numeric measure, such as, greenhouse gas emissions, toxic waste, etc. or a set target was in the disclosure, thus implicitly bringing qualitative concepts into their analysis, a matter expanded upon next.

Representation

Brammer and Pavelin (2006a) defined a set of indicators that relate to the quality of CER, which they took from commonly cited standards setters and applied a dichotomous instrument (has/does not have) in their analysis. More specifically, they considered: group-wide environmental policy, environmental initiatives, improvement in key areas of environmental performance, environmental audit and target-setting as

proxies for CER quality. However, by using a dichotomous indicator, in the form of "take the value one [if the content falls in each aspect of disclosure] and zero otherwise" for elements in reporting (Brammer and Pavelin, 2006a, p.128), their results elicited the comprehensiveness of the content in the disclosures, rather than the quality of the information provided.

Also using a dichotomous approach, but as an alternative to capturing the incidence of the set of disclosure issues in qualitative description, van der Laan Smith et al. (2005) defined the disclosure quality according to whether it contained numerical terms. This numerical perspective on quality has been adopted in several studies, e.g. Adams et al. (1998), Al-Tuwaijri et al. (2004), Hasseldine et al. (2005), Hughes et al. (2001), Patten (1995) and Toms (2002). Numerical matters have been taken in conjunction with other elements that the researchers have believed to signify aspects of disclosure quality, but there has been a wide variation in the way these items have been analysed. For instance, whilst Adams et al. (1998) and Patten (1995) included a presentation of quantifiable terms as a second dichotomous index after identifying the presence or absence of predetermined disclosure issues, others have integrated these numeric aspects by devising an increasing ordinal inclusion scale, whereby at each level a new item is added until all the desired items have been covered.

A pioneering work on CER quality evaluation by Wiseman (1982) rated the disclosure within predetermined categories, based on both the presence or absence and the degree of specificity of each of the information items. More specifically, a four level classification was applied to the data as follows in descending order: disclosure including specifically quantitative or monetary features, specifically non-quantitative descriptive, non-specific terms and no disclosure. This technique that relies on using an ordinal scale has been widely adopted in recent studies (e.g. Al-Tuwaijri et al., 2004; Beck et al., 2010; Clarkson et al. (2008)[4]; Cormier and Gordon, 2001; Cormier and Magnan, 1999, 2003; Cormier et al., 2005; Hasseldine et al., 2005; Hughes et al., 2001; Toms, 2002; van Staden and Hooks, 2007). Moreover, these authors have taken into account such matters as the: perceived precision, relevance and usefulness for decision making of the disclosed information when developing their approaches to measuring the

[4] These researchers have employed a mixture of scoring scales, involving both dichotomous and ordinal disclosure indexes.

information disclosure quality (Cormier et al., 2005). Further, their disclosure measurement has involved assigning a numerical score with the systematic allocation of weights to different disclosure items, based on the perceived importance of each item to the various user groups.

In general, in accordance with Wiseman (1982), their ordinal scale pattern has placed the greatest weight on quantified and/or monetary disclosure items, followed by non-quantified, but specific items, then general non-quantified ones. Nevertheless, apart from recognising the significance of physical quantities and monetary terms, it is discernible that most of these more recent works have included further criteria in the scoring scale, such as: data presented relative to industry competitors, previous periods and targets, shown in absolute and normalised form, as well as data at the sector level (Clarkson et al., 2008). Moreover, data in relation to the implementation and monitoring of corporate specific environmental initiatives (Toms, 2002; Hasseldine et al., 2005) and yearly comparison of environmental performance by a firm (Beck et al., 2010), has also been included.

However, these methods, despite involving drawing on previous literature for guidance, are prone to criticism, because of the subjective choices made by the researcher when compiling the scales (Hammond and Miles, 2004). In particular, when deciding upon the elements to be included in the aforementioned ordinal scales, how they are dealt with in the hierarchy is left to the researcher and there is substantial variation across studies, which leaves them vulnerable to the accusation of being too subjective. Moreover, their interpretation can be confusing to other researchers, because within the ordinal scales there are sometimes inconsistencies. For example, in Beck et al. (2010) although a cumulative method was used to form their rankings, according to Wiseman (1982) as described above, the highest rank included the qualities: quantitative, comparable and narrative, whereas the next rank down contained quantitative and narrative, thus if the information possessed quantitative and comparable content it could not have been assigned to the scale. A similar confusion arises in the interpretation of data for Clarkson et al.'s (2008) seven point ordinal scale and Toms (2002) and Hasseldine et al.'s (2005) six point scale. In addition, as with a dichotomous scale, although these rankings are set to identify whether the observed corporate disclosures contain a certain item or not, they can not measure the intensity or level of the

information provided and hence, could be deemed as being unfair on strong reporting organisations (Beattie et al., 2004; Brammer and Pavelin, 2006a).

The concept of quality of environmental reporting has not only been considered in terms of the comprehensiveness of content in the extant literature covered above, but has also been covered in this way in several benchmarking surveys and guidelines, such as those of: the ACCA (1999, 2005, 2007), BiE (2000, 2002, 2003), BiC (2004), OXERA Environmental Ltd. (2000), the GRI (2006b) and DEFRA (2006). In these surveys, the concepts of completeness, reliability/credibility, understandability/readability, relevance, clarity, and/or other such desirable qualitative characteristics from financial reporting frameworks, have been adapted as their criteria (e.g. ACCA, 1999, 2005, 2007; DEFRA, 2006; GRI, 2006b) for establishing the guidelines for assuring CER quality. However, in all of the works, as with the literature above, quantification of the environmental impact is the common feature of CER quality (Brammer and Pavelin, 2006a).

More specifically, the DEFRA and the GRI guidelines identify the quantified reporting of environmental indicators e.g. total materials use, energy consumption, total water withdrawal, greenhouse gas emissions, total amount of waste output, etc. (DEFRA, 2006; GRI, 2006b). Additionally, these bodies indicate the importance of quantified reporting of future targets (ACCA, 1999, 2005, 2007; DEFRA, 2006; GRI, 2006b; OXERA Environmental Ltd., 2000) to enable users to verify or refute a company's stated intention of improving environmental performance. DEFRA (2006) also has called for reporting of quantity items in absolute and normalised forms in its guidelines, so as to be able to make meaningful comparisons across firms and industrial sectors. Whilst the assessment criteria in the GRI, DEFRA and OXERA Environmental Ltd. guidelines are specifically identified according to the main environmental activities, the BiE and ACCA's schemas contain a wide ranging set of instructions on how firms can generate environmental activism. In general, researchers could use any of these surveys and guidelines to investigate disclosure quality, because they all take the form of dichotomous or ordinal indexes, but as mentioned previously, the preferred guidelines in most of the prior research have been those of the GRI, especially GRI (2002).

2.1.3 Measuring CER Using Decision Usefulness Constructs

A number of empirical studies, employing a mixture of measurements of environmental information disclosure that ranges from the volume-based to the extent of information content-based, have established the notion of user decision impact regarding CER (e.g. Al-Tuwaijri et al., 2004; Graham et al., 2000; Richardson and Welker, 2001, etc.). This would appear to echo the notion of decision usefulness in terms of: understandability, relevance, reliability and comparability and consistency of the disclosed information, as found in financial reporting frameworks. However, in spite of this connection and the decision impact observations none of the prior research has considered quality in terms other than content analysis. Therefore, one way of underpinning quality measurement of CER could be to draw on these decision usefulness measures, a line of reasoning that is developed in full in chapter 3.

2.2 How Measures of CER have been Used

2.2.1 Explaining Disclosure Variation

Analyses of environmental information disclosure practices have been carried out to explain variation in a particular country and/or industry and across countries, industry sectors, or time, using: volume-based (e.g. Adams and Kuasirikun, 2000; Campbell, 2004; Cho et al., 2010; Deegan and Gordon, 1996; Gray et al., 1995; Hackston and Milne, 1996; Holland and Boon Foo, 2003; Zeghal and Ahmed, 1990), a range of the extent of information content-based measures (e.g. Beck et al, 2010; Buhr and Freedman, 2001; Gamble et al., 1996; Ho and Taylor, 2007; Jose and Lee, 2006; Lynch, 2010; Yongvanich and Guthrie, 2005), or even a mixture of the two (e.g. Adams et al., 1998; Guthrie and Parker, 1990; Harte and Owen, 1991).

In general, analysis of the disclosure in these studies has largely relied on that in annual reports, with the exceptions to this being: Ho and Taylor's (2007) inclusion of stand-alone reports and home site web pages, Buhr and Freedman's (2001) further study on security exchange filings and stand-alone reports, Zeghal and Ahmed's (1990) addition

of the examination of other published material, Lynch's (2010) study on reporting by government departments and Cho and Roberts's (2010) and Jose and Lee's (2006) research on web page disclosures. The sample sizes for most of these studies comprised 100 observations or less, but a few covered larger samples, such as: the international comparative studies of Guthrie and Parker (1990), Gamble et al. (1996) and Adams et al. (1998); Cho et al.'s (2010) examination of the disclosure of 190 firms; Jose and Lee's (2006) work, which examined 200 multinational corporate websites in 2002 and Lynch's (2010) research into 324 annual reports of Australian state government departments covering 2001 to 2008.

Among these studies, those of Cho et al. (2010), Campbell (2004), Hackston and Milne (1996), Harte and Owen (1991) and Zeghal and Ahmed (1990) examined environmental disclosure in a single country. Cho et al. (2010) investigated US corporate environmental disclosure utilising content analysis software based on the frequency of word occurrence and their results showed that the degree of bias in environmental disclosure is negatively related to a firm's environmental performance. The volume of environmental disclosure of ten UK companies in five industry sectors was analysed between 1974 and 2000 in Campbell (2004) and the findings from the longitudinal and cross-sectional analysis showed an overall increase in the disclosure volume over the period, in particular in the late 1980s/early 1990s, when a marked increase in social and environmental pressures occurred. Regarding the cross-sectional effects, a positive association between environmental disclosure and the vulnerability of the five sectors to environmental criticism or liability was elicited. Hackston and Milne (1996) also found evidence regarding the amount of environmental disclosure variation among industries from a sample of New Zealand firms. In addition, they discovered that firm size is significantly associated with disclosure volume, whereas profitability is not. Without considering different industrial sectors, Harte and Owen (1991) investigated how 30 UK companies provided environmental information in their annual reports in 1990, eliciting that little detailed information was provided, given the widespread absence of good news, thus providing evidence for the legitimacy theory argument that corporate image was being protected.

With regards to international comparative studies, a substantial number have been carried out involving empirical investigation of social and/or environmental practice

between two developed countries, e.g. Germany and the UK in Adams and Kuasirikun (2000) and Beck et al. (2010), the UK and the US in Holland and Boon Foo (2003) and the US and Japan in Ho and Taylor (2007). By examining either the volume or the incidence of the disclosure practice, the explanation for any difference between two countries was generally found to lie in the dissimilarities of the regulatory environments. With regards to empirical investigation of more than two countries, Guthrie and Parker's (1990) findings from the annual reports of 147 firms in 1983 indicated that more information content relating to social and environmental issues was provided in the US and the UK than in Australia, whilst no significant difference was found in terms of the disclosure volume among these three countries. Despite an unclear picture of these countries' variations, they further observed that firms tend to react minimally to the regulatory requirements in order just stay on the right side of the law, especially in the UK.

Gamble et al. (1996) and Adams et al. (1998) extended the inter-country comparisons to examine social and/or environmental reporting practices from a wider sample of countries. With respect to the former, based on the degree of environmental issues coverage, these authors analysed the annual report disclosures for a sample of firms from nine industries and 27 countries during the period between 1989 and 1991. Overall, their findings show that financial standards, classified as British-American vs. Continental accounting models, have an influence on the variation in the environmental reporting practices among the countries covered. Adams et al. (1998) employed a sample of 150 companies from six Western European countries, using both volume-based and the information content extent-based measures and their findings also revealed that the amount and extent of the disclosure varied significantly across Europe. More specifically, German companies, on average, disclose the most information and the UK is second, and the explanation of the variation, according to these authors, very much lies in stakeholder pressures and legitimising actions (Adams et al., 1998). Government involvement in relation to social and political environments of the countries was put forward as possibly being influential; however, this consideration was beyond the scope of their study. In addition, they discovered that firm size and industry membership influence the disclosure patterns in all six countries.

Another representative study with an emphasis on overall variation of the disclosure across an extensive period of time is that of Gray et al. (1995), who used a volume-based measure to examine UK social and/or environmental disclosure over a period of 13 years, starting in 1979 and they concluded that change over time and firm size are important factors for most areas of voluntary disclosure. Moreover, they interpreted their results as providing support to the: political economy, legitimacy and stakeholder theories. Having considered variation in environmental reporting in terms of the nature, pattern or volume across firms, industries and/or time, next there is a detailed discussion on the motivations for such reporting.

2.2.2 Motivations for CER

In addition to the above literature, an increasing body of CER study has focussed on explanations for the variation in the amount and extent of the different types of social and/or environmental information reporting. With regards to this, a firm's characteristics as well as its environmental efficiencies have been put forward as providing explanations for motivating firms to disclose this information and hence, also the variation. These are, for example, size (measured by revenues, total assets, etc.) and/or industry classification (e.g. Brammer and Pavelin, 2004, 2006b; Clarke and Gibson-Sweet, 1999; Patten, 2002a; 2002b), country of origin (as mentioned above), society and community concerns (e.g. Deegan and Gordon, 1996; Deegan et al., 2002), profitability (e.g. Roberts, 1992) and environmental performance (e.g. Al-Tuwaijri et al., 2004; Brammer and Pavelin, 2004, 2006b; Cho and Patten, 2007; Cho et al., 2010; Clarkson et al, 2008; Hughes et al., 2001).

These empirical studies have attempted to explain the motivations behind voluntary environmental reports at any given level of information disclosure, using either volume-based or extent of information content-based measures to capture what has been disclosed. The researchers in question have employed:, legitimacy, stakeholder and institutional theories, either singularly or in combination as aspects of social and political theory, to explain disclosure variations from a several standpoints (e.g. Cho and Patten, 2007; Clarke and Gibson-Sweet, 1999; Deegan and Gordon, 1996; Deegan et al., 2002; Gray et al., 1995; Neu et al., 1998; O'Donovan, 2002; Patten, 2002b as

discussed further below). The overall conclusion from these studies has been that interest groups, stakeholders and/or society have substantial influence over the types, amounts and timing of company disclosures. More specifically, the existence of reporting guidelines, public responsibility attached to the company, company concerns over legitimacy and reputation, competition, risk management, markets, innovation and corporate morale (Deegan and Unerman, 2006; Gray, 2006), have all been identified as having an influence on the disclosure variation. However, as Deegan (2002) has asserted, there could be several motivations concurrently driving companies to disclose their environmental information and it is unlikely that one dominates above all others. In addition, Gray et al.'s (1995) empirical findings that time and firm size are important explanatory factors, as highlighted above, raises the question as to whether any single conceptual framework can adequately capture the determinants of CER. Consequently, this researcher supports the view of Cormier et al. (2005) that to investigate the variation in environmental disclosure, a range of determinants (for example, corporate specific characteristics, such as: firm size, industry, country and profitability) need to be considered and this can only be effectively achieved through a multi-theoretical lens, the nature of which is discussed next.

Stakeholder Theory

Within the stakeholders' demand-driven view, "the disclosure of particular types of information can be used to gain or maintain the support from particular groups [in the society]" (Deegan and Blomquist, 2006, p.349). One reason for managers voluntarily to report environmental information is to manage particular stakeholder groups, possibly influential stakeholders, by complying with their expectations (Neu et al., 1998; Ullmann, 1985). Moreover, Neu et al. (1998) highlighted that particular stakeholder groups have more influential requirements in relation to environmental responsibility disclosures than others. More specifically, their empirical study, based on the amount of disclosure, showed that particular companies were more likely to make disclosure responses to address the concerns of financial stakeholders and government regulators, which were perceived as being more important or powerful, than those of environmentalists. Similar results were reported by Roberts (1992), who elicited that company managers use social and environmental disclosures as a proactive tool to

influence their stakeholders. In detail, using ordinal ratings developed by the Council on Economic Priorities (CEP) to measure the extent of disclosure content, their findings showed stakeholder power, strategic posture and economic performance were important determinants of variation. Similarly, based on both the amount and extent of the disclosure, van der Laan Smith et al.'s (2005) discovered that the presence or absence of stakeholder orientation could explain variations in disclosure levels.

Considering CER studies from an international perspective, Adams and Kuasirikun (2000) and Gamble et al. (1996) set out to determine whether there is a significant difference in the type and level of environmental disclosure and although they did not adopt any particular theoretical stance, the stakeholder theory perspective can explain the variation found. Gamble et al. (1996) elicited that there are extreme differences in such practices among and within the sample countries and that they are not consistently applied across time. Moreover, they found that high social consciousness on environmental issues and sophisticated capital markets in countries such as: Sweden, Canada, the US and the UK, resulted in voluntary disclosure levels of environmental information beyond the mandatory requirements. However, the issue of what caused the companies within each industry to change their disclosure patterns was not considered in their work and this deserves further attention. Adams and Kuasirikun (2000) examined the range and extent of CER disclosures in the annual reports of the largest UK and German pharmaceutical and chemical companies, between 1985 and 1995. That is, they examined both comparatively and longitudinally what environmental information the sample companies were reporting using content analysis and discovered that reporting practices of these two nations had developed along very different trajectories, despite the fact that the companies they investigated belonged to the same industry. Consistent with the perspective of stakeholder theory, they concluded that the key factors that caused this diversity in reporting between the two countries were: industry initiatives, the extent of environmental responsibility legislation and other external social and political pressures.

Focusing on the purposes for companies to disclose environmental information, Rezaee et al. (1995) and Gamble et al. (1995) highlighted the importance of regulators and accounting standard setters as stakeholders. Rezaee et al.'s (1995) findings showed that the disclosures did not specifically address the issue of environmental reporting at the

time of their research. However, by the time that Miles et al. (2002) identified corporate governance pressure as one of the key drivers for a company's initial decision, environmental issues were often included in their annual reports and accounts so as to show how environmental risk was being internally managed. In other words, the findings of these studies point to the increasing use of CER as a part of strategic management aimed at company success. However, capturing just the amount and/or extent of disclosures is arguably insufficient, if the aim is to see whether the disclosures satisfy the users' needs, a view supported by the evidence of Gamble et al. (1995), which revealed that environmental disclosures provide inadequate information for the users.

Legitimacy Theory

One factor that has been asserted by a number of researchers as the motivation for environmental disclosures, is the desire to legitimise an organisation's operations, by demonstrating that they have behaved as good corporate citizens (e.g. Adams et al., 1998; Clarke and Gibson-Sweet, 1999; Deegan and Gordon, 1996; Deegan and Rankin, 1996; Deegan et al., 2002; Gray et al., 1995; Patten, 1992, 2002b). This management motive for making environmental disclosures fits in with the legitimacy theory framework, in which organisations are seen to have contracts with society and by fulfilling these, this will legitimise them and their operations. Within the legitimacy perspective, it was suggested by Lindblom (1994) that social and/or environmental disclosure may be used as a company legitimising device to: inform the relevant members of the public about changes in performance on these matters, change the perceptions about organisational social and/or environmental performance, divert attention from publicly identified problems regarding a social and/or environmental issue by highlighting other accomplishments or to alter public expectations of social and/or environmental performance.

Empirically testing legitimacy theory, Patten (1992) studied changes in environmental disclosures by North American oil companies after the Exxon Valdez oil spill and concluded that such spills diminish the legitimacy of all oil companies, thereby triggering an increase in environmental disclosures, in terms of the number of pages in

their annual reports. Deegan and Rankin (1996) investigated the alterations in environmental reporting in annual reports in relation to prosecutions for environmental offences. Using a volume-based measure to capture the disclosing amount, they found that there was a significant increase in environmental disclosures surrounding such incidents, with prosecuted companies providing more positive information than those that had not. Relying on legitimacy theory for their explanations, Deegan and Gordon's (1996) results provide evidence that the volume of a company's environmental reporting is positively related to an increase in environmentally interested parties and that the reporting places most emphasis on the positive actions taken. Moreover, these authors found that the amount of environmental disclosures made positively correlates with the environmental vulnerability of the industries that the companies belong to. This is similar to Clarke and Gibson-Sweet's (1999) results, which revealed that companies in high environmentally sensitive industries are more likely to use separate reports to their annual report to illustrate and explain their investment in environmental issues. Adams et al.'s (1998) results from observation of social and environmental disclosures in annual reports from 150 companies across six European countries, using both the volume-based and the extent of information content-based measures of reporting, also support legitimacy theory, in that they revealed: size and business industry effects. Moreover, positive association between environmentally sensitive industrial sectors and the amount of environmental disclosure, as found in Campbell (2004), is also consistent with legitimacy theory.

In some previous research papers it has been claimed through legitimacy theory that there is a positive link between a firm's environmental performance and disclosure, whilst in others the opposite has been reported. On the one hand, researchers have posited that under this lens a firm will only disclose if it has positive news about its contribution to the environment (Al-Tuwaijri et al., 2004; Brammer and Pavelin, 2004; Hooghiemstra, 2000). On the other hand, it has been asserted that poor environmental performance by a firm will enhance the need for it to provide more extensive environmental disclosure so as to secure its legitimacy (Cho and Patten, 2007; Hughes et al., 2001; Patten, 2002a, 2002b). Moreover, the responses from one qualitative interview research endeavour by O'Donovan (2002) lend support to the latter situation. This issue is returned to and discussed in greater detail in the next subsection.

In general, the evidence to date from scholars investigating the legitimacy perspective does not provide strong grounds for rejecting the view that company actions are rooted in a priority need to protect their legitimacy. This is consistent with Friedman's (1970) earlier view that there is business advantage in appearing to be socially and/or environmentally responsible and this may well be the key motivation of organisations, rather than the wish to be considered to be the purveyors of good corporate citizenship. Likewise, more recently several researchers have pointed out that "business-case reasons increasingly dominate the motivations to report" (Gray, 2006, p.72). Under this assumption, it would be expected that the extent of disclosure activity is determined by the costs and benefits both of performing well with regards to social and/or environmental issues and disclosing this information (McWilliams and Siegel, 2001).

Institutional Theory

Institutional theory provides a complementary perspective that partly overlaps with legitimacy and stakeholder theories (Deegan and Unerman, 2006). Under this lens, it is argued that a manager is constrained by the pressure to modify or implement certain environmental reporting practices. These pressures can be coercive from the stakeholders that the organisation is dependent upon (coercive behaviour), mimetic for reasons of competitive advantage in terms of maintaining legitimacy (mimetic behaviour) or normative, which relates to the pressures arising from group or society norms (normative behaviour) (DiMaggio and Powell, 1983). Under this perspective, it has been pointed out that environmental disclosures could be being managed so as to build an image about an organisation's environmental performance that is vastly different from its actual performance, which fits with legitimacy theory (Deegan and Unerman, 2006). However, in this case the drivers are the aforementioned behaviours, rather than the priority being simply to preserve legitimacy. To date, there have been very few empirical environmental disclosure studies specifically aimed at testing institutional theory concepts, with Cormier et al.'s (2005) on coercive and mimetic behaviours and Rahaman et al.'s (2004) on normative behaviour being counted amongst these. One good reason for this paucity of research through this lens is because of the overlap that was asserted by Deegan and Unerman (2006), as explained above, regarding legitimacy theory as well as the fact that stakeholder theory motivations can

be seen as being synonymous with coercive and mimetic behaviours under the institutional perspective. In other words, investigations drawing upon the stakeholder and legitimacy theories have, to some extent already identified the practices pertaining to institutional theory, but have not labelled them in the same way.

Moreover, according to institutional theory organisations are coerced to engage in routine actions that involve simply replicating their own disclosures from a previous period so as to maintain stakeholder expectations (DiMaggio and Powell, 1983). Although nearly all previous longitudinal CER research has adopted the stakeholder or legitimacy theory perspectives, it could be argued that the motivation for maintaining or improving this reporting involves coercive behaviour due to pressure from outside agents and hence, there is further overlap with institutional theory. Further, over time an organisation may imitate the practice of another organisation that is widely perceived to be a leader or a benchmarker (DiMaggio and Powell, 1983), which has also been acknowledged in the two first theoretical approaches. However, when coercive behaviour is taken together with mimetic behaviour from a temporal perspective, this introduces a new approach to understanding a firm's CER trajectory. To date, only one study by Cormier et al. (2005), using a disclosure index based on the extent of information content with a degree of specificity scale for large German companies, has specifically considered companies' mimetic behaviours and coercive actions in CER disclosure decisions. Their results suggest that disclosure is converging to industry medians for this over time and hence, can be taken as pertaining to mimicry. In addition, their results showed that a set routine determines the level of the disclosure in a given year.

Epistemology of These Theories

Denzin and Lincoln (2011, p.13), among others, have asserted that all research is "guided by a set of beliefs and feelings about the world and how it should be understood and studied". These premises form a paradigm (Guba, 1990) which shapes how a researcher determines what the inquiry is, how research is practised and how results are interpreted (Denzin and Lincoln, 2011). The positivist paradigm considers "accounting phenomena as concrete real world relations possessing regularities and causal

relationships that are amenable to scientific explanation and prediction" (Riahi-Belkaoui, 2004, p.316) and is the predominant paradigm in accounting research (Riahi-Belkaoui, 2004). Studies within this paradigm seek to predict and explain particular accounting practice through observations (Deegan and Unerman, 2006) which with the hypothetic-deductive approach "may be used to verify or falsify a theory" (Riahi-Belkaoui, 2004, p. 317). Riahi-Belkaoui (2004) asserts that such studies, for example, might simply test for share price reaction to the public release of accounting information to test the hypothesis of semi-strong market efficiency. In addition, labelled as Watts and Zimmerman's (1990) positive accounting theory which draws upon principal-agent relationship, this author further claimed that these studies might seek to predict and explain why managers elect to use particular accounting methods in preference to others.

The main criticism of these studies under the positivist paradigmatic lens is that although they were undertaken with some objectivity, they involved value judgements. That is, as Gray et al. (1987) argued, they had certain presuppositions about the world that determined what to research and which aspects of particular events to examine. These posited abstractions of reality and hence, perfect predictive or explanatory ability cannot be expected in all cases. In relation to this, implicit in the market reaction and positive accounting theory studies there has been an acceptance of the efficient market hypothesis and wealth maximisation respectively and, what is more, these studies shared certain elements of the essential foundations of accounting theory (Riahi-Belkaoui, 2004). Moreover, with its empirical nature within this paradigm, it may be the case that a theory is not always supported in practice because of the: different settings, different types of purposes and different methods used, thus lessening its ability to be confirmed or refuted. With regards to this, it could be argued that positivist researchers always have an excuse for the failure of their theories (Riahi-Belkaoui, 2004). Furthermore, researchers with this positive perspective, Deegan and Unerman (2006) contended, overlook a number of specific relationships and only gather data that they consider relevant, thereby making the theories used neither strictly confirmable nor falsifiable. This criticism suggests some merits of other research paradigms. All in all, by implication, these positive theories of accounting only provide the basis for empirical testing purposes.

Following from the above points, research paradigms within which researchers approach social and/or environmental disclosure studies, in particular, those employed with the use of the three aforementioned theories as explanatory theories, are briefly reviewed in order to describe the limitations on the knowledge that is obtained by the studies' empirical testing.

A number of prior empirical studies in social and/or environmental disclosure referring to legitimacy, stakeholder and institutional theories for explanations (as reviewed above) have largely been situated within the positivist paradigm. Under this paradigm, it is assumed that there is a reality to be observed, measured and interpreted, and researchers with this perspective have relied on a predominantly quantitative set of investigative methods (Denzin and Lincoln, 2011). Thus, previous studies of CER have emphasised measurement of disclosure (mainly through content analysis) and verification of hypotheses based on the theory under examination, with statistical analysis being used to conclude on the consistency of the observations with theory.

Limitations from this approach take a number of forms. First, there are limitations in connection with the reliability of data generated by quantifying disclosure. This type of concern has been noted among researchers and discussed in detail by Milne and Adler (1999) and Unerman (2000) in the context of CER research. In particular, they highlighted issues with regards to the accuracy of the coding procedure and the coding instruments specifications, which may undermine the robustness of observations. These issues are related to the concern that the coding protocol may allow for coder interpretation and hence bias. Second, further limitations arise in that the theories to be tested do not "provide accurate predictions in all cases" (Deegan and Unerman, 2006, p.15) and their evidence, in the main, only supports or contradicts the theory. That is, without firm theoretical predictions, the hypotheses set are always subject to researcher subjectivism. In relation to this, with a positivistic approach to generate numerical data, the ability of the theories to withstand empirical use in predicting and/or explaining disclosure practice is relatively limited within such subjectivity view. Accordingly, at best the theories can be tested and statistical findings generated from such testing are limited to the researcher's preconceptions, i.e. they only cover what they know and hence, provide fairly weak indication of the real situation. In other words, the theories

can be used as different conceptual lenses to explain observed practices reported on in a research activity, but this explanatory power is bounded.

Overall, similar to reflection on positive theories of accounting, therefore, these limitations of the positivist perspective in this context mean that it is not possible to claim with absolute certainty that based on these reporting studies theories can be proved or disproved.

Referring to the hypothesised propositions with a positivist perspective, legitimacy theory has very much been utilised to explain changes in disclosure practices in terms of whether they form part of strategies to: gain, maintain or restore corporate legitimacy, whilst stakeholder theory has been used to test the ability of stakeholders to have an impact on reporting practices. Both theories assume that there are societal expectations in corporate behaviour regarding social and/or environmental disclosures and this largely gives rise to common hypotheses formulation for testing them. Regarding this, it implies an inadequacy of the theories in terms of their independence. Moreover, realistically, it might be the case that such presuppositions do not exist and there are other managerial influences that have the greatest influence on disclosure behaviours (see for example, Wilmshurst and Frost, 2000). Furthermore, although empirical analysis under stakeholder theory has involved "referring to particular groups within society" (Deegan and Unerman, 2006, p.285) to identify those that have the greatest impact on social and/or environmental reporting, the outcomes have been rather simplistic in that they have only identified the strongest player(s) in determining the disclosure, rather than delving more deeply by investigating the perceptions of the stakeholders themselves. Similar to that found in positive theories of accounting, this incompleteness in common hypotheses construction leads to a weak level of falsifiability when testing these two theories.

Recent empirical use of institutional theory by Cormier et al. (2005) has been concerned with how firms institutionalise their social and cultural values, under a similar assumption to that of the two aforementioned theories regarding the existence of societal expectations as well as the caveat of there being a limitation of the information collected in relation to its completeness in hypotheses development. Consequently, this implies similar shortcomings of this theory in that as with the other two at best it can be

used for hypothesis testing purposes through observation or for providing description of the reporting behaviour, but not for accurate predictions in all cases, i.e. generalisability.

The limitations of the positivist approach have spurred some researchers to shift their paradigmatic stance when investigating environmental reporting practices to one of interpretivism, but such studies are as yet few in number. Under the interpretivist lens, it is assumed that there are multiple realities that are socially constructed and cannot be determined objectively (Denzin and Lincoln, 2011). Interpretivist researchers rely on an inductive approach involving exploration and speculation aimed at developing new theoretical contributions, i.e. by interpreting observations. Moreover, rather than employing remote and inferential empirical methods to understand the disclosure practices, these academics adopt a set of methodological procedures that directs their attention to the specifics of particular cases. For example, Campbell and Slack (2011) employed semi-structured interviews to examine attitudes to environmental information disclosure by sell-side bank analysts. Further, consistent with Tilt's (1994) argument that legitimacy theory is resident within the interpretivist paradigm, O'Donovan (2002) also used semi-structured interviews to probe the attitudes of a sample of six managers to elicit whether there was an extant support for legitimacy theory. Finally, under the stakeholder theory perspective, Miles et al. (2002) also sought to investigate influences of social and environmental disclosure by interviewing both its users (such as fund managers) and preparers (such as senior management and board members of companies).

Notwithstanding the above discussions, many researchers as well as this one have recognised the limitations of positivism in CER studies, but they have still continued to adopt this perspective in their studies. That is, they have taken the view that these issues are not obstacles to research but constitute limitations that should be recognised when interpreting the results.

Next, the issue of the relation between CER and environmental performance, as raised as a motivational aspect in legitimacy theory, is considered in detail.

2.2.3 Examining the Link between Disclosure and Environmental Performance

Many researchers have addressed the relationship between environmental reporting and environmental performance, with the assumption that the willingness to make disclosures is influenced by an organisation's record of environmental performance (e.g. Al-Tuwaijri et al., 2004; Brammer and Pavelin, 2004, 2006b; Rockness, 1985; Ullmann, 1985; Wiseman, 1982). On the one hand, some previous research papers have suggested that, if voluntary environmental disclosure depends upon a company's environmental performance, under the legitimacy theory lens a company's keenness to report only good performance and its reluctance to report perceived deficiencies, means that such disclosures are "self-laudatory" (Brammer and Pavelin, 2004, p.89; Hooghiemstra, 2000, p.57). Under these circumstances, a positive relationship between environmental performance and disclosure is expected. On the other hand, after Patten (1992) discovered substantial increases in disclosure pre and post the Exxon Valdiz oil spill, as mentioned above, other researchers also found this negative relationship, concluding that under legitimacy theory a company with poorer environmental performance will provide more extensive environmental disclosure to protect its status (e.g. Brammer and Pavelin, 2006a; Cho and Patten, 2007; Gray et al., 1995; Hughes et al., 2001; Patten, 2002a).

However, the empirical results remain inconclusive as to this relation, perhaps owing to the variations in the environmental performance proxy used, which has included: using a reputational index (Belkaoui and Karpik, 1989) and undisclosed or unclear principles of external organisation ratings, such as: the CEP's environmental performance ratings (Rockness, 1985) and Ethical Investment Research Service (EIRIS) ratings (Brammer and Pavelin, 2004). Others have analysed a limited range of environmental data from external databases, such as: the ratio of toxic waste recycled to toxic waste generated, gathered from the Corporate Environmental Profiles Directory published annually by the Investor Responsibility Research Centre (IRRC) (Al-Tuwaijri et al., 2004) and total toxic waste from the US Environmental Protection Agency's (EPA) TRI database along with the percentage of total toxic waste recycling (Clarkson et al., 2008), thus restricting any generalisability of the findings. Brammer and Pavelin (2006a, 2006b) used aggregated fines by a company over a number of years as the environmental

performance proxy and regressed this against a particular year's environmental disclosure and consequently, were unable to match significant fines in that year with changes in disclosure levels. Moreover, these fines were information that was fully internalised into the financial accounting sphere and hence, through this treatment environmental externalities that could not be internalised were overlooked. A whole host of measures for capturing the environmental disclosure was employed in these studies, involving either volume-based or extent of information content-based forms, or both, further providing explanation for their diverse outcomes.

Regarding the empirical outcomes, a positive relationship between the incidence of social and/or environmental disclosure and environmental performance was observed by Al-Tuwaijri et al. (2004), Brammer and Pavelin (2004), Clarkson et al. (2008)[5] and Harte and Owen (1991), whereas a negative result was elicited by Brammer and Pavelin (2006a, 2006b), Cho and Patten (2007), Cho et al. (2010), Hughes et al. (2001) and Patten (2002a). Further, several studies revealed no significant association between the two (e.g. Rockness, 1985; Wiseman, 1982).

2.2.4 The Value-Relevance of CER Information

Research on environmental disclosure can have the goal of investigating the decision usefulness of disclosed environmental information for: analysts, fund managers, institutional investors and share prices. That is, the CER information needs of users have been assessed through its impact on decision making. A range of measures of the disclosed information has been employed in these studies, in addition to survey and interview techniques, including: volume-based, extent of information content-based and certain accounting information, such as environmentally related costs collected by external organisations and the abatement costs of pollution in accounting statements.

An early experimental study by Belkaoui (1980) discovered that the stock investment decisions of a variety of users were affected by the inclusion of environmental information in reports. However, Belkaoui (1984) and Benjamin and Stanga (1977)

[5] These, however, interpreted the positive relationship as being determined by economics based voluntary disclosure theories (Clarkson et al., 2008).

found that the financial community only paid moderate attention to social and/or environmental disclosures. In stock market reaction studies into whether there are any relationships between pattern and/or volume of corporate environmental disclosures and capital market performance, Ingram (1978) and Anderson and Frankle (1980) found evidence, though not statistically significant, of a positive stock price reaction to social and/or environmental disclosures. More recent investor surveys (Epstein, 1992; Epstein and Freedman, 1994; Deegan and Rankin, 1997) have reported significant shareholder demands for the disclosure of environmental performance, thus suggesting a marked shift in concern regarding these.

Graham et al.'s (2000) empirical results indicated that corporate environmental obligations information is a significant negative factor in explaining the credit ratings of new bond issues. Whereas, Richardson and Welker's (2001) empirical findings revealed that there is a significant positive relation between environmental disclosures and the cost of equity capital for sample of Canadian firms, using year-end data for 1990 to 1992. Nevertheless, the outcomes of the studies of Al-Tuwaijri et al. (2004) and Ullmann (1985) revealed no relationship between disclosure and share price, thus demonstrating that investigations regarding this matter have produced inconclusive results. Murray et al. (2006) replicated these US studies that compared environmental disclosure volume with share returns using data from the top 100 UK companies, with the implication that the latter represented the level of management competency. Although their results led to the conclusion that there is no clear direct relationship between the two variables, they were of the opinion that their longitudinal tests have provided convincing support for there being a positive correlation between share returns and the corporate tendency to disclose. Some early surveys (Harte et al., 1991; Rockness and Williams, 1988) reported that social and/or environmental information in annual reports was perceived as being useful for investors who wished to make specific ethical investments. Further, the data collected from interview research by Solomon and Solomon (2006) indicates that public social and environmental information disclosure is not considered adequate for institutional investment decisions, thus by implication it is considered decision useful.

In general, although mixed results have emerged, the literature demonstrates that there is a fair amount of evidence supporting the view that environmental information is

useful for decision-making by financial stakeholders. However, it would appear that in nearly all of these studies current (and potential) investors have been considered to be the primary users of corporate environmental information and other types of potential users have largely been ignored. In this regard, Gray et al. (1995, p.51) asserted that interest in social and/or environmental information "is not motivated predominantly by a concern … of financial participants", which supports the view that CER can be of interest to other types of stakeholders yet to be investigated in any detail.

2.3 Limitations

2.3.1 Lack of a Theoretical/Conceptual Framework

The review of the previous studies above has shown that a variety of methods has been used to: explain variation in environmental disclosures, test motivational theories, examine the link between environmental disclosure and performance and to test the value relevance of the disclosed information. First, there have been those research endeavours that have considered the quantum of CER captured by content analysis, with the key assumption that the amount of environmental information items provided in the disclosures relates to their significance as perceived by the reporting firm, which has been shown to be problematic. Moreover, with this approach, other potential weaknesses have been identified, such as: dissimilarity in writing styles in the reports, in particular, in terms of levels of succinctness, font size variations and hence, numbers of pages, across companies and time (Brammer and Pavelin, 2006a; Hackston and Milne, 1996), as well as the relevance and consistency of the disclosed categories, as these have been heavily reliant on the researchers' subjective judgments.

Second, a growing research interest in the quality of environmental disclosures has emerged to offer another explanation of the disclosure; however, as yet, there is no uniform definition of 'quality'. In this regard, many researchers and several benchmarking surveys and guidelines have extensively employed measures of information reporting based on the extent of the information content. However, because the emphasis of these measures has been on the level of coverage of reporting issues or

the way in which each item is represented, this has meant that the general approach is still based on content of the disclosures, rather than any independent qualitative schema. Moreover, the former has involved the practice of simply combining aspects of environmental disclosures that may make a contribution to their overall quality (Beattie et al., 2004; Brammer and Pavelin, 2006a), which implies an unfairness in the scoring procedure and the latter cannot distinguish between the amounts of disclosure for a particular item, thus replicating this element of unfairness.

In addition, referring to the relevance of the disclosed information, the overall measures of the previous studies have been insufficiently comprehensive, in terms of their not having taken into consideration all the various aspects of business activities. As discussed above, the different nature of business activities brings varying levels of concern in relation to environmental impacts, which in turn significantly influences environmental disclosure strategies. With regards to this, some elements could be more significant for the public actors in some industries than for those in others, for example, carbon emissions data is considered more important in carbon-intensive sectors than in low-carbon ones. Therefore, the indiscriminate use of such measures in the extant literature could be problematic, because it has failed to elicit whether there are discernable differences in environmental concerns across industrial sectors.

Although DEFRA (2006) has developed key performance indicators for CER by sector types and GRI has issued Sector Supplements as pilot documents containing specific social and environmental performance indicators for some industries (approximately 7 industries at the time of the development of this thesis, see for example, GRI, 2003, 2005a, 2005b, 2006a, 2007, 2008a, 2008b), there has not yet been any empirical evidence of CER quality assessment in accordance with their industry-specific indicators. In addition, as indicated above, the guidelines are mainly focussed on the content of information and hence, the concept of quality has not been explicitly and consistently incorporated as a measure.

2.3.2 Empirical Limitations

Scope for Judgement

In general, previous studies have mostly focussed on the annual report as the principal source of data, claiming that it is the most important readily available source of information on corporate activities (e.g. Adams et al., 1998; Beck et al., 2010; Campbell, 2004; Cho et al., 2010; Gamble et al., 1996; Guthrie and Parker, 1990; Holland and Boon Foo, 2003; Neu et al., 1998; O'Donovan, 2002). Nevertheless, companies are increasingly using a variety of alternative reporting media, e.g. press releases, separate reports, etc. Regarding these, Unerman (2000) highlighted the problem that when these are used as source data their format is inconsistent and incomparable, but in spite of this a growth in separate standalone reports on environmental matters has specifically recently been evidenced (Tilt, 2008), thus posing a difficulty for researchers in this field. Moreover, because of these new outlets for reporting, company annual reports are losing their previous comprehensiveness, for effective enquiry must include these rather disparate forms. This would suggest the need for a disclosure quality assessment procedure that is valid for supplementary reporting arrangements.

Samples

American, European (including the UK) and Australian studies on the levels of disclosures have been the most frequent and even though a substantial number of inter-country comparisons have been made few of these have covered the UK with the US. In addition, it is notable that several research projects have only considered firms from the most environmentally high profile industries (e.g. Adams and Kuasirikun, 2000; Deegan and Gordon, 1996; Deegan et al., 2002; Patten, 1992; Yongvanich and Guthrie, 2005) for examination and hence, their findings have had restricted explanatory scope. This would suggest there is a need to pay more attention to cross-sectional analysis, if more robust generalisable theory is to be developed.

Proxy for Environmental Performance

As discussed above in some detail in subsection 2.2.3, the proxies for environmental performance used in prior research, for the reasons explained, have been a further limitation and hence, this issue needs addressing carefully in this research endeavour and this is done in chapter 4.

Institutional Theory Perspective

Prior disclosure research, as discussed in subsection 2.2.2, has drawn on motivational theories to provide explanations for the variation in corporate social and/or environmental reporting practices. However, as also noted above, institutional theory has been neglected in this respect and in this researcher's opinion it deserves to be engaged with. Therefore, inspired by Cormier et al.'s (2005) study in relation to this issue, in this thesis this perspective is probed to elicit whether it can further illuminate understanding regarding the motivations for disclosure.

Disclosure Value-Relevance to Other Users

With regards to previous studies that tested the value-relevance of the disclosed information, as discussed above in subsection 2.2.4, it would appear that nearly all of them focussed on its impact on financial stakeholders and largely ignored other stakeholders. Here, this issue is taken into consideration and hence, is incorporated into the research questions and hypotheses development in the next chapter (chapter 3).

2.4 Conclusion

In general, previous CER studies have employed various measurements to capture environmental information disclosure, largely in terms of content. However, even where the quality of information has been considered, the measures used have extensively relied on information content and hence, no consistent conceptual framework that underpins robustly the concept of quality has yet been developed. As a result, the findings of the various studies on environmental disclosures are largely inconsistent,

non-transferable and lack generalisability, which gives them limited explanatory power. This gap in the literature provides the key motivation of this research to devise a conceptual framework of CER quality that is dependent upon the quality of environmental disclosure rather than its amount or extent. Regarding this, it has been noted that in the previous literature it has been elicited that CER is of moderate importance to investment decision-making and although this scholarship only provided a financial stakeholder focus, it did identify the notion of decision usefulness in environmental disclosure. In this researcher's opinion, this perspective offers a fruitful way of developing the aforementioned quality framework, in particular, because it is grounded in a well-researched field, namely financial reporting and also because the current guidelines available do not contain such a rigorous link to real world activities. In other words, the most effective way of developing a robust testable environmental disclosures framework is to conduct a multi-disciplinary study as explained and justified in chapter 3. More specifically, the current non-financial guidelines are to be enhanced in the new qualitative framework by drawing upon financial reporting frameworks.

Subsequently, so as to demonstrate its validity and greater strength when compared with other approaches, the new framework is used to test the motivational theories regarding environmental disclosure, namely the: stakeholder, legitimacy and institutional theories. Moreover, it is also used to test for any association between environmental and financial performance and its sign.

3 Theoretical Development and Research Questions

The various measures of CER have all used the content of the information, as pointed out in chapter 2, thus there is a lack of a conceptual framework for environmental reporting, which motivates this research endeavour. In addition, the research into the determinants of corporate environmental disclosure decisions has drawn upon three prestigious socio-political theories: stakeholder, legitimacy and institutional theories, to explain the variations in disclosures. However, much of the empirical attention has been given to the two foremost and hence, a further aim here is to incorporate plausible institutional impacts on the disclosure into the enquiry regarding its quality. In this chapter the aim is to address the topic of environmental disclosure and its determinants, by developing a theoretical framework to analyse this disclosure as regards to its quality and to elucidate the effects of an identified set of factors, so as to demonstrate the validity and greater robustness of the framework when compared with treatments in prior research. As explained in chapter 1, the qualitative characteristics of decision-useful information, adapted from financial reporting frameworks along with elements of such information already available in non-financial reporting guidelines, are used to examine the determinants of variation and to test the theories of motivation.

Despite acknowledging the limitations of the positivistic methodology, as discussed in chapter 2, such an approach is considered the most appropriate for this research in line with the majority of previous empirical studies into social and/or environmental disclosure theories. This is because with this perspective for measuring the disclosure and explaining its motivation, at least an underlying 'truth' of the disclosure (albeit retaining a subjective element in content analysis) can somewhat be determined from independent observation that tends to generate numerical data, thus allowing statistical analyses. Given the value-laden nature of disclosure measurement and theory selection as well as the theoretical limitations, regarding independence and falsifiability, this obviously undermines robustness of the findings on the disclosure practices. That is, observation here can only provide some degree of confirmation of the theories and hence its confidence yield cannot be compared with one that is derived from scientific study. In sum, the aim is to provide proof of propositions rather than to explain in depth how and why the relationships have developed and are evolving. More specifically, the

goal is CER measurement for testing theory, which is best achieved through a positivist lens.

This chapter is organised as follows. In section 3.1, there is a brief review of the financial reporting model and its relevance to CER, so as to provide background to the framework developed for the qualitative measure of environmental disclosure for this research. In 3.1.1, the major existing financial reporting theories and their adaptation are introduced and this is followed by a comparative examination of the existing financial reporting conceptual frameworks in subsection 3.1.2. In subsection 3.1.3, the proposition to implement qualitative concepts from these frameworks for non-financial reporting is made and justified, a process facilitated by comparing them with the GRI Guidelines. Subsequent to this, the framework for assessing the quality of environmental disclosure is constructed and illustrated in section 3.2, which leads to the generation of the first research question and hypothesis. In section 3.3, the framework is used to examine the factors affecting CER quality variation, as found in the literature on motivation covered in the last chapter, and these factors are explained, whilst developing the remaining research questions and hypotheses that are to guide the empirical analysis. The chapter concludes with a brief summary in section 3.4.

3.1 The Financial Reporting Model and Its Relevance to CER

As discussed in the last chapter, the empirical evidence suggests that CER is of moderate relevance to investment decision-making. As also explained in the previous chapter, proponents of motivational theories suggest that a company will design its environmental reporting to manage expectations regardless of performance (Brammer and Pavelin, 2006a, 2006b; Cho and Patten, 2007; Hughes et al., 2001). Moreover, according to positive accounting theorists, CER could be dependent upon managers' choices in relation to: the individual rewards, the effects of debt constraint, or the level of political scrutiny (Watts and Zimmerman, 1990). However, as yet, perhaps partly because environmental information disclosure is still voluntary and unregulated, no comprehensive framework has been established that can assess the veracity of these claims. Therefore, it would seem logical and reasonable to draw upon financial reporting frameworks relating to decision usefulness in order to construct a CER

conceptual framework, in the case of this research, regarding its quality. That is, this researcher posits that the qualitative characteristics of financial information outlined in these conceptual frameworks can be used to help build a robust non-financial qualitative framework that can be applied empirically to identify the motivations for environmental reporting.

In support of the adaptation of financial frameworks, Solomon (2000) concluded that there is an implicit framework within which environmental reporting could shadow financial reporting. In this regard, his findings from a postal questionnaire survey of the attitudes of 267 individuals and/or organisations indicate that: qualitative characteristics, verification, corporate cost-bearing manner, time period and communication, are common features across firms in the UK when reporting their environmental information. A widely accepted conceptual framework for non-financial information reporting, the GRI Guidelines, was developed in 2000 and the latest version at the commencement of this study, in 2006, contains a large number of similarities to this author's contentions, regarding the desirable qualitative characteristics sought in financial reporting. In addition, the criteria put forward by ACCA UK ERA Scheme (ACCA, 1999) and DEFRA (2006) include similar qualitative characteristics. Nevertheless, although a few empirical studies have been undertaken to measure the quality of environmental reporting in relation to the decision-useful attributes of such frameworks (e.g. Cormier et al., 2005; Ho and Taylor, 2007), as mentioned in the literature review, they were focussed on content of disclosures. In sum, although researchers have identified a range of qualitative characteristics for CER no normative frameworks for measuring this have yet been devised or tested.

According to the financial reporting frameworks, in spite of their having been drawn up to meet the needs of shareholders, their decision usefulness characteristics are also of relevance to other users, for "as investors are providers of risk capital to the entity, the provision of financial statements that meet their needs will also meet most of the needs of other users that financial statements can satisfy" (IASB, 2001, paragraph 10). Therefore, it is reasonable to assume that these other users, who constitute the main users of CER are likely to demand the same qualitative characteristics for this reporting as for financial reporting when evaluating the decision usefulness of the information provided. That is, this implies that although CER may not purely be directed towards

users' economic decision-making, the information contained within it should have decision-useful characteristics for those users to ensure the credibility of the reported information. Moreover, it has been argued that the qualitative characteristics for assessing CER should be drawn up based on those used for financial reporting (Federation of European Accountants (FEE), 2000; Gray et al., 1996).

3.1.1 Financial Reporting Theories and their Adaptation

Combined with agency theory and positive accounting theory, decision usefulness became one of the dominant paradigms of accounting (Deegan and Unerman, 2006). Moreover, mainstream capital market research has provided strong evidence that decision usefulness is an essential feature in framing accounting standards (e.g. Ball and Brown, 1968; Beaver et al., 1968). After testing the decision usefulness of accounting information, Ball and Brown (1968) documented that share price changes were linked to earnings announcements. Subsequent empirical studies (e.g. Ali and Hwang, 2000; Bao and Chow, 1999; Bartov et al., 2005; Francis and Schipper, 1999; Hand, 2005; Vafeas et al., 1998) also demonstrated that changes in accounting information (such as earnings and book value of equity) are associated with share price responses, thus supporting the relevance of such information to investors' decision-making. From other studies it emerged that not only the announcements of actual earnings appear to cause share price movement, but that the announcements of expected earnings also appear to have this effect (e.g. Imhoff and Lobo, 1984).

Under the agency theoretical assumptions within positive accounting theory researchers found that management's voluntary choice of accounting procedures can explain actual accounting practices, as depending on: individual rewards (Healy, 1985), company debt constraints (DeFond and Jiambalvo, 1994; Sweeney, 1994), or level of company political scrutiny (Watts and Zimmerman, 1978). However, the positive approach to accounting does not seek to determine what accounting choice should be, but rather it explains what it is (Belkaoui, 2004). Therefore, accepting that people use accounting information when making investment decisions, normative theories of accounting, which are the conceptual frameworks of financial reporting advanced by professional accounting bodies, i.e. the UK Accounting Standards Board (ASB), the US Financial

Accounting Standards Board (FASB) and the International Accounting Standards Board (IASB), are the most suitable guidance on what this information should be. In general, among these frameworks, qualitative characteristics, such as: understandability, relevance, reliability and comparability and consistency, of the information have invariably been identified as desirable features for the achievement of the fundamental objective of communicating decision-useful financial information.

In order to address the issue raised above as to whether corporate environmental information disclosure has decision-useful characteristics and whether the characteristics used in financial reporting are applicable to non-financial (environmental) reporting, the qualitative characteristics of financial information from different frameworks are analysed in detail in the next subsection. Once this has been established, this is followed by an adaptation of them to non-financial reporting in light of their decision usefulness for CER users, as explained above.

3.1.2 Financial Reporting Conceptual Frameworks

The major existing financial reporting frameworks, such as the UK ASB (1999), the US FASB (1980) and the IASB (2001), discuss the fundamental objective of financial reporting in terms of information that is useful to a wide range of users[6] in making economic decisions (ASB, 1999, paragraph 1.1-1.2; FASB, 1978, paragraph 34-52; FASB, 1980, paragraph 22; IASB, 2001, paragraph 12). In order to elucidate the essential characteristics of the aforementioned frameworks for informing the construction of the CER quality framework, in the following subsections the areas of comparability and difference in the context of, first, the definition of decision usefulness and, second, the qualitative characteristics that are associated with such usefulness, are elicited.

Definitions of Decision Usefulness of Financial Reporting

[6] The users of financial information include: present and potential investors, employees, lenders, suppliers and other trade creditors, customers, governments and their agencies and the public (ASB, 1999, paragraph 1.3; IASB, 2001, paragraph 9).

Decision usefulness refers to the level of support that information provides to the users in making their decisions (ASB, 1999, paragraph 1.3; FASB, 1978, paragraph 9; IASB, 2001, paragraph 12), so first, it is important to identify who the users are. Regarding this, the FASB and IASB frameworks identify a particular group of primary users. FASB's framework focuses on information useful for making rational investment and credit decisions (FASB, 1978, paragraph 34) aimed at present and potential investors, creditors and their advisors. This framework further suggests that financial report preparers should provide information: for assessing cash flow prospects (paragraph 37), regarding resources, claims to a firm's resources and changes in them (paragraph 40-54), relating to enterprise performance and earnings (paragraph 42-43) and concerning liquidity solvency and fund flows (paragraph 49). Whereas the IASB's framework supports the view that if information meets the needs of a particular group of users, it is likely to satisfy most of the needs of and to be useful for other users, as previously mentioned. More specifically, paragraph 15 in the framework suggests that economic decision-useful information should focus on the financial position, performance and changes in financial position of an enterprise in order to enable users to evaluate the ability of an enterprise to generate cash and cash equivalents (IASB, 2001, paragraph 15).

In the third framework considered here, the ASB, it is stated that different users have different economic purposes for using financial statements and these usually require different useful information (ASB, 1999, paragraph 1.3). However, it is acknowledged that there are some overlaps in the information required by these users, these being the financial performance and financial position of the enterprise and in the framework, this common interest of users comprises the main focus. In other words, so as to be useful to a wide range of users for assessing the stewardship of management and for making economic decisions, this framework recommends that financial reports should provide information about the financial performance and financial position of an enterprise (paragraph 1.6).

Although the definitions of the usefulness of accounting and financial information, as defined by the FASB, ASB and IASB frameworks, differ to some extent in terms of the primary users and the aspects of information identified, it is contended by this researcher that this difference is too insignificant to be of concern here. Therefore, these

frameworks are eligible for meaningful comparison. Moreover, they all identify: understandability, relevance, reliability and comparability and consistency, as the qualitative characteristics for the achievement of the objective of communicating decision-useful financial information. Further, although there is substantial agreement about these attributes there are some differences in their meaning and the elements that they contain, as discussed next.

Financial Reporting Qualitative Characteristics

The FASB distinctively classifies the qualities above into those viewed as user-specific and those inherent in the information (FASB, 1980, paragraph 37). Relevance, reliability and comparability (including consistency) are viewed as the key attributes for reporting quality and the other characteristics are viewed as sub-attributes of these in the process. Understandability is viewed as a user-specific property in this framework, which encompasses both the characteristics of the information and of the information-user (FASB, 1980, paragraph 40), so it would appear to be problematic to evaluate this qualitative characteristic without referring to a set of decision makers. Additionally, the framework suggests that the benefits provided by the disclosure of information should exceed its cost (paragraph 134) and all qualities shown should be subject to a materiality[7] threshold, which refers to the situation that a decision not to disclose certain information may be made, because the amounts involved are too small to make a difference (paragraph 123-132). Moreover, the framework indicates that both reliable and relevant information are ideally to be equally produced (FASB, 1980, p.5). It is, hence, assumable that a balance between quality characteristics is suggested as a constraint, although it is not explicitly proposed in the framework.

The ASB's Statement of Principles for Financial Reporting also considers the qualities of financial information that make it useful, ending up with the same four main qualitative characteristics as the FASB: relevance, reliability, comparability and

[7] Materiality involves judgements which refer if the "item [is] large enough for users of the information to be influenced by it" (FASB, 1980, paragraph 123). It is the magnitude of "the omission or misstatement of an item in financial report [that], in the light of surrounding circumstances,…[makes] it is probable that the judgement of a reasonable person relying upon the report would have been changed or influenced by the inclusion or correction of the item." (FASB, 1980, paragraph 132)

understandability. However, in this framework it appears that relevance is a general quality that is used as a selection criterion for all stages of the financial reporting process. When there is a conflict between the characteristics of relevance and reliability, it is suggested that the former attribute should take precedence (ASB, 1999, paragraph 3.1). This framework also puts materiality as a threshold quality of financial information, in that providing information that is not material may have a negative impact on the meaning and understandability of the other information provided (paragraph 3.28-3.29). In addition, a balance between qualitative characteristics is suggested as a constraint when a conflict between the characteristics arises (paragraph 3.33). Timeliness is also indicated as a constraint in the framework in that it is highlighted that there is a trade off between relevance and reliability of financial information (paragraph 3.35).

Turning to the IASB framework, this specifies an objective of financial reports as providing information useful for decision making and identifies four qualitative characteristics that determine the usefulness, these being exactly the same as in the prior two cases. However, here it is suggested that the recognition of information, which is relevant but unreliable in nature or in representation, may possibly misinform when a decision is undertaken (IASB, 2001, paragraph 32). Conversely, in terms of timeliness, the information may be greatly reliable if its reporting is slightly delayed, but it may be of little interest to users who have to make decisions in the interim (paragraph 43). Therefore, in order to achieve a balance between relevance and reliability, it is posited that it is advisable to consider how much the information meets the economic decision-making needs of the users (paragraph 43). Additionally, in practice, balances between benefit and cost and between qualitative characteristics are also suggested in this framework (paragraph 44-45). A comparative analysis of qualitative characteristics, including the above three frameworks and the GRI (see below) is summarised in table 3.1 below.

Table 3.1: Qualitative Characteristics of Financial Information – Comparison of the Frameworks and the GRI Guidelines

Qualitative Characteristics	Statement of Financial Accounting Concepts US FASB (FASB, 1980)	Statement of Principles for Financial Reporting UK ASB (ASB, 1999)	Framework for the Preparation and Presentation of Financial Statements IASB (IASB, 2001)	*Sustainability Reporting Guidelines Version 3.0* *GRI (GRI, 2006b)*
Understandability				
• Readily understandable by users/Users' abilities	✓ User-specific characteristics	✓ Users' abilities	✓	✓ *Clarity*
• Aggregation and classification	✓ Characteristics inherent in the information	✓		✓ *Clarity*
Relevance				
• Predictive value	✓	✓	✓	✓ *Sustainability context*[(a)]
• Feedback (or confirmatory) value	✓	✓	✓	✓ *Sustainability context*[(b)]
• Timeliness	✓			
• Materiality			✓	
Reliability				
• Representational faithfulness	✓	✓	✓	✓ *Reliability*[(c)]
• Verifiability	✓			✓ *Reliability*[(d)]
• Neutrality	✓	✓	✓	✓ *Reliability*[(e)]
• Free from bias and material error	✓	✓	✓	✓ *Accuracy*[(f)]
• Completeness	✓	✓	✓	✓
• Prudence/Conservatism	✓	✓	✓	
• Substance over form		✓	✓	
Comparability and Consistency				
• Through time	✓	✓	✓	✓
• Between enterprises	✓	✓	✓	✓
• Disclosure of accounting policies		✓	✓	✓ *Disclosure of environmental policies*
• GAAP consistently applied	✓	✓	✓	✓ *Generally accepted protocols applied*
Constraints				
• Benefit and cost balance	✓		✓	
• Timeliness		✓	✓	✓
• Qualitative characteristics balance	✓	✓	✓	
Threshold				
• Materiality	✓	✓		✓
GRI Specific				
• ***Stakeholder inclusiveness***				✓
• ***Sustainability context***				✓
• ***Balance between positive and negative aspects***				✓

(a) Description of how sustainability topics relate to long-term organisational strategy, risks and opportunities
(b) Presentation of performance with reference to broader sustainable development conditions and goals
(c) Identification of the original source of information and representation is from the original data or information owners attesting to its accuracy within acceptable margins of error.
(d) Scope and extent of external assurance
(e) Reliable evidence to support assumption or complex calculations
(f) Margin of error for quantitative data should not be sufficient to significantly influence stakeholders' ability to reach appropriate conclusions on performance.

Summary

In general, it can be seen in table 3.1 that the FASB, the ASB and the IASB use an almost identical set of four qualitative characteristics for indicating the decision usefulness of financial information: understandability, relevance, reliability and comparability and consistency. Moreover, even though they sometimes use different phrases for the various aspects of qualitative characteristics, these have virtually analogous meanings, thus indicating that these three frameworks are essentially the same.

However, when considering the qualitative characteristic of reliability, difference in the notions of what the concept means are observed and only the FASB focuses on verifiability separately from the faithful representation aspect of reliability. In this regard, the FASB claims that the purpose of verification is to "provide a significant degree of assurance that accounting measures represent what they purport to represent" (FASB, 1980, paragraph 81), whereas the ASB and IASB focus more on faithful representation, combined with: neutrality, substance over form, prudence and completeness. In relation to the first of these concepts, paragraph 3.8 (a) in the ASB framework and paragraph 31 in the IASB framework state that information is reliable when it can be depended upon by the users to represent faithfully what it purports to represent, which implies the need for a means of assuring users to what extent they can depend on the information made available.

Concerning the comparability characteristic, all the three frameworks adopt a similar sense, that of a comparison being purposed to detect and explain similarities and differences between the nature and effects of transactions and other events taking place over time and across different reporting entities (ASB, 1999, paragraph 3.22; FASB, 1980, paragraph 113 and 119; IASB, 2001, paragraph 40). Moreover, although FASB's framework does not explicitly suggest the disclosure of accounting policies and its consistency to be presented in financial reporting, as with the other two frameworks, the fact that it does call for the identification of similarities and differences means that these two attributes can be considered implicit. Further, FASB's framework is concerned with timeliness as an additional feature of relevance (FASB, 1980, paragraph 56), whilst the

other two frameworks see this as a constraint on the qualitative characteristics of relevance and reliability. However, all the frameworks adopt a similar logic that when there is a delay in reporting the information, it may lack relevance, whereas if it is disclosed too soon it may lack reliability, thus recognising that there is a time factor that needs to be taken into account (ASB, 1999, paragraph 3.35; FASB, 1980, paragraph 56-57; IASB, 2001, paragraph 43). That is, regarding constraints, a balance between qualitative characteristics is suggested in all the three frameworks. However, although a balance between benefit and cost is required in the FASB and IASB versions, it is not in that of the ASB, but this can be considered a minor dissimilarity as it refers mainly to the information preparer and user's aspects, rather than the characteristics inherent in the information itself. In addition, materiality is considered as an element of relevance in the IASB, whereas the other two frameworks view this as a threshold. However, the implications for this in all the three frameworks are the same.

In sum, regarding the comparative analysis between the three frameworks above, the similarities between them underpins the fact that these three standard setting bodies require similar qualitative characteristics that financial information should have, if it is to be useful for decision making.

3.1.3 The Adaptation of Financial Reporting Frameworks to Non-Financial Reporting

Comparative Analysis of the GRI Guidelines with the Financial Reporting Frameworks

The GRI Guidelines identify "Principles for Defining Report Content" in a sustainability report as including: materiality, stakeholder inclusiveness, sustainability context and completeness (GRI, 2006b, p.8-13). Moreover, regarding "Reporting Principles for Defining Quality" these guidelines suggest that a report should provide a balance between positive and negative issues, comparability, accuracy, timeliness, clarity and reliability (p.13-17).

The Specific Qualitative Characteristics of the GRI Guidelines

Notably, stakeholder inclusiveness, sustainability context and balance between positive and negative aspects appear to be specific elements of the quality in the report as defined by the GRI Guidelines. These additional specific aspects are included owing to the non-financial nature of information in a sustainability report or CER. However, when the contents of sustainability context and balance between positive and negative aspects (GRI, 2006b, p.11 and 13) are considered, it can be seen that they are linked to the relevance characteristic of decision-useful financial reporting, thus implying that relevance is also required as one of the qualitative characteristics of CER. Similarly, although it is not explicitly stated in the Guidelines, the definition of and explanation for stakeholder inclusiveness (p.10) may be seen as the CER constraint. In addition, because of the very different nature of the information being reported in environmental disclosure, regarding the bounds of the system for referring, unlike in financial reporting, the three specific elements to the GRI Guidelines identified above are not clearly defined.

Similarities between the Qualitative Characteristics of the GRI Guidelines and the Three Financial Reporting Frameworks

As presented in table 3.1, there are some similarities in the characteristics contained within the GRI Guidelines and the three financial reporting frameworks. For instance, materiality, completeness, timeliness, comparability and consistency, which are represented as the qualitative characteristics or constraints of financial reporting, are also included in the GRI Guidelines, as characteristics which an environmental report should have in order to be useful for the users. However, it emerges that the materiality concept in CER, referred to as a threshold characteristic, is more complex than that referred to in financial reporting. This is because of the fact that this concept should not be considered only in scale terms as it may well be more dependent on the nature and circumstances of a specific item or event. Completeness refers to the fact that all issues that are considered to be important should be disclosed in CER, for ignoring any of them may result in stakeholders, i.e. readers of CER, being misled. Timeliness pertains to the recommendation that all CER should be undertaken according to a regular

schedule and that the information in it should be accessible in time for a stakeholder to make decisions.

Comparability and consistency refer to the need for CER information users to be able to compare the results of organisational environmental performance over time with the aim of identifying any significant trends so as to ensure that: recognition, measurement and presentation of such information is robust. Under the comparability characteristic, the GRI Guidelines state "explaining the methods and assumptions used to prepare information" (GRI, 2006b, p.14), thus implying that firms should disclose their measurement policies in a sustainability report. This can be seen as being akin to the disclosure of accounting policies under the comparability and consistency characteristics of decision-useful financial reporting. Similarly, the Guidelines suggestion to "utilise generally accepted protocols for compiling, measuring and presenting information" (GRI, 2006b, p.15) could be regarded as mirroring the Generally Accepted Accounting Practice/Principles (GAAP) consistency characteristic under the comparability and consistency attribute of financial reporting. Further, the characteristic of clarity in the Guidelines can be considered as being equivalent to understandability in the financial reporting frameworks, thus signifying that not only financial reporting but also CER is required to present information: clearly, understandably and accessibly for the users.

Identification of the original source of information, attesting to its accuracy within acceptable margins of error, scope and extent of external assurance and reliable evidence to support assumption or calculations, are identified as the components of the reliability qualitative characteristic in the GRI Guidelines. These can be seen as being equivalent to representational faithfulness, verifiability and neutrality, respectively, which are also the elements of reliability in the financial reporting frameworks. Free from bias and material error, which is a sub-attribute of the reliability characteristic of decision-useful financial reporting, is implicitly suggested as a characteristic of useful sustainability reporting under the element of accuracy in GRI Guidelines. That is, in this element it is stated that the margin of error for quantitative data should not be so great as to influence significantly report users' ability to reach appropriate conclusions on company performance (GRI, 2006b, p.15). In sum, these similarities demonstrate that in order for users to make the correct judgements, CER, according to the GRI Guidelines,

also needs to possess the characteristics of reliability, in terms of: representational faithfulness, verifiability, neutrality and freedom from bias and material error.

Substantial similarities in the qualitative characteristics of the GRI Guidelines for environmental reporting and the frameworks of decision-useful financial reporting have emerged in the above discussion. Thus, it is posited that the qualitative characteristics of financial information, suggested in the FASB, ASB and IASB frameworks, can be adapted to define the attributes of decision-useful non-financial reporting information, such as in the reporting of organisations' environmental performance.

Omitted Characteristics in the GRI Guidelines

However, there are limitations in this correspondence. For example, it can be observed in table 3.1 that prudence, substance over form, benefit and cost balance and the qualitative characteristics balance, which are considered as qualitative characteristics or constraints when preparing a financial report under the three financial information frameworks, are not explicitly considered in the GRI Guidelines. This is of no consequence, because non-financial information contained in a sustainability report or CER has a different nature to the financial information included in financial reporting, especially in relation to its limited compulsion. Nonetheless, it could be argued that prudence, which comes under reliability in the financial frameworks, should be a characteristic in high quality CER. That is, to ensure the reliability of such non-financial reporting, as with financial reporting, it should be necessary to consider and disclose any conditions of uncertainty, concerning the potential consequences of organisations' environmental incidents and uncontrolled impacts or releases, thereby not withholding information that can have an influence on the users' decision-making.

Further, also in relation to reliability, it could be argued that substance over form should be included as a qualitative characteristic of non-financial reporting. That is, presenting information in accordance with its environmental substance and context rather than a strict form is important, for although such information may be accurate, if it is presented without a context that users can employ regarding their decision-making then it may not be useful. For example, disclosing emissions data without discussing the impact of such

emissions on the environment or the efficiency of the production process from which they arose can limit the usefulness of the disclosure.

Moreover, benefit and cost balance constraint should be taken into account in CER. In this regard, the GRI Guidelines state "…the cost of gathering it [data]…may result in a legitimate decision not to disclose… [But] where material information is omitted; the report should clearly indicate this and the reasons why" (GRI, 2006b, p.37), but fail to mention the benefits explicitly. That is, in the Guidelines, unlike in the financial reporting frameworks, the balance between benefits derived from such information and the cost of providing or acquiring it has not yet clearly been considered for either the preparers or the users. In addition, qualitative characteristics balance should also be considered as a constraint of CER. With respect to this, referring to the notion of the conflict between reliability and relevance as indicated in the financial reporting frameworks (ASB, 1999, paragraph 3.34; FASB, 1980, p.5; IASB, 2001, paragraph 43), it is assumed here that this conflict also arises in the case of non-financial information. Therefore, it is posited that when preparing CER companies should aim to ensure a balance between these qualitative characteristics, and what is more this balance should be extended to include the other qualitative characteristics of understandability and comparability and consistency.

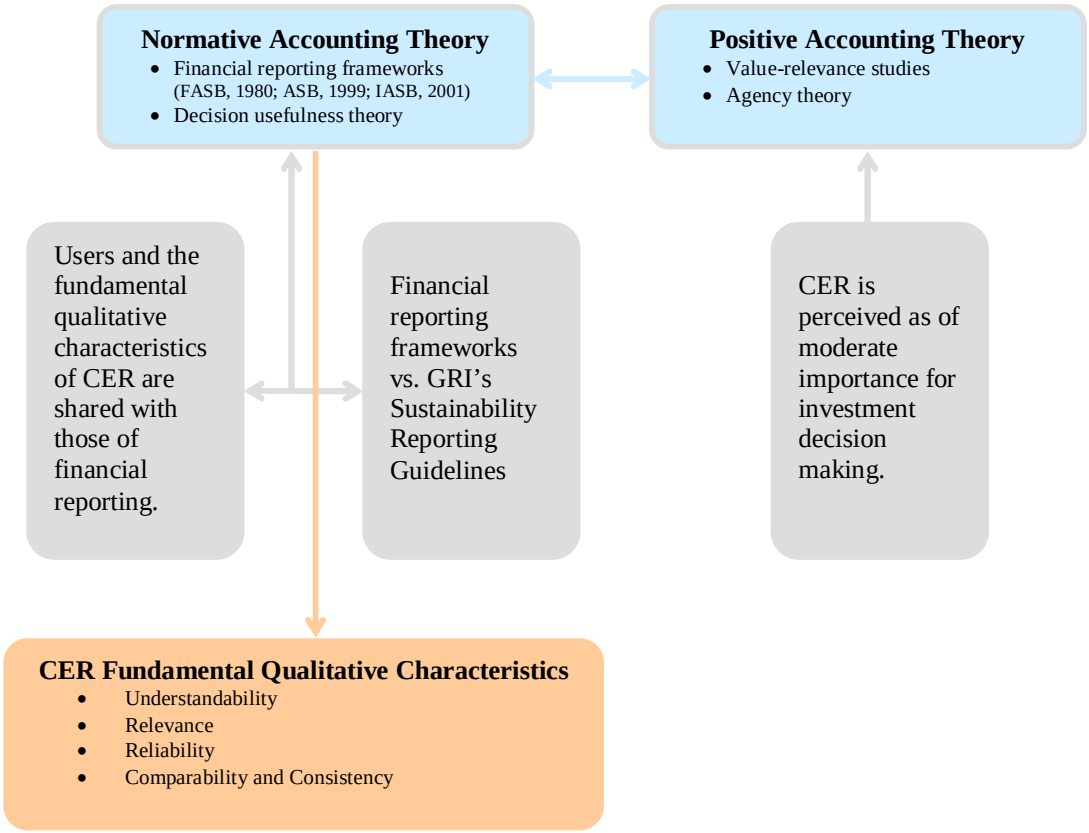
The Composition of the Qualitative Framework for this Study

To sum up, although the above discussion has illustrated the specific characteristics provided by the GRI Guidelines that the three financial reporting frameworks do not indicate, when comparing the former with the latter it is apparent that the qualitative characteristics of financial information can be drawn upon for non-financial information for decision usefulness, because of the distinct similarities of the attributes. That is, the four main characteristics of financial reporting are deemed suitable in this research to be used as the categories for assessing CER quality. However, owing to the fact that most environmental information is non-financial rather than financial, which is the main focus for financial reporting frameworks, the specific elements of these qualities, as contained in the Guidelines, are to be retained for this examination. Moreover, prudence, substance over form, benefit and cost balance and qualitative characteristics

balance, taken and modified from financial reporting qualitative features, are also included in the framework for this research.

In view of what has been elucidated above and in conjunction with the previous empirical work (discussed in the previous chapter), which has concluded that environmental disclosure is perceived as of moderate importance for investment decision making, as in the case of financial reporting studies on positive accounting theories, it is assumed that the concept of financial reporting qualitative features for user's decision usefulness can be adapted for non-financial environmental reporting, as shown in figure 3.1 below.

Figure 3.1: Financial Reporting and Its Application to CER

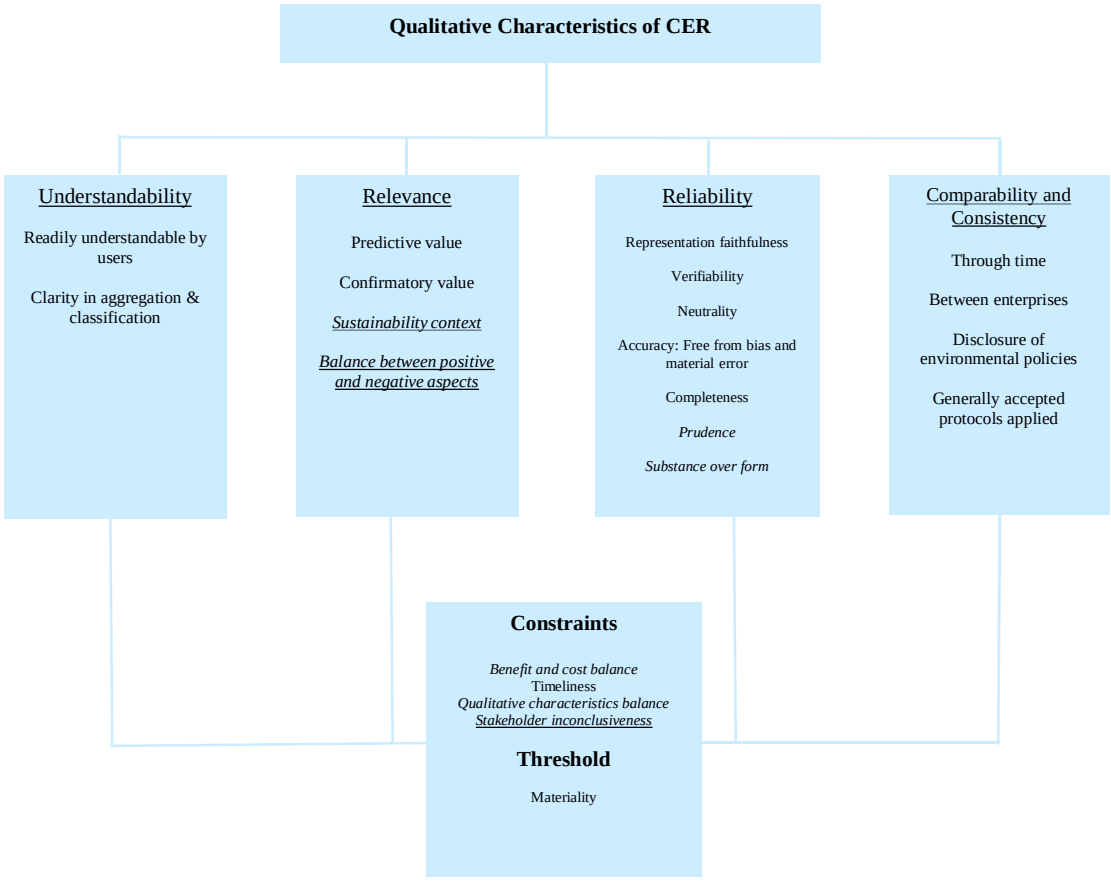


The remainder of this chapter is devoted to developing the framework of CER quality and the research questions as well as the hypotheses that are devised to examine the determinants of its variation in CER quality and in addition for testing the theories of motivation.

3.2 Qualitative Characteristics of CER

The proposed four main qualitative characteristics of CER and their different elements, pertaining to the previous discussion in 3.1, are illustrated in figure 3.2. The specific characteristics provided by the GRI Guidelines are underlined and italicised, whereas the omitted aspects are just in italics.

Figure 3.2 Qualitative Characteristics for CER: An Application of Normative Theories of Financial Reporting (ASB, 1999; FASB, 1980; IASB, 2001; GRI, 2006b)



This framework is to be used to assess whether companies provide these qualitative characteristics in their environmental reporting practice and, if they do provide them, how and why these characteristics vary between firms. This gives rise to the first research question.

Research Question 1:

To what extent do current CER practices provide the decision-useful characteristics of: understandability, relevance, reliability and comparability and consistency and how much variation is there between their levels of effectiveness?

Related to this, the extent to which companies balance these four qualitative attributes in their CER also needs to be established. That is, will it emerge that one of these aspects receives much greater attention than the others. Recall from the case of financial reporting, it is plausible that information can be relevant but unreliable, whereas by contrast it can be very much reliable but of no or little interest to the users, depending on the timeliness of the information disclosure. In relation to this, the IASB financial reporting framework advises of a need to have a balance between information relevance and reliability (IASB, 2001, paragraph 43). Given the potential similarity in qualitative characteristics with financial reporting, this imperfectly-correlative nature among the four main qualitative characteristics inherent to the information can be assumed to transfer to non-financial disclosure. Therefore, CER disclosure may be relevant but it may not be reliable or understandable to users. For example, the environmental key performance indicators (KPIs) suggested by the GRI Guidelines (GRI, 2006b, p.27-29) may indicate the relevance of the information disclosed, but may not signal that the information is understandable. Likewise, CER information may easily be comprehended, but it may not possess the relevance or reliability features that are useful for decision making.

Holland and Boon Foo (2003, p.16) have suggested that regarding the user's perspective in disclosure interpretation, the UK voluntary disclosure practices appear to "favour user requirements for understandability and relevance" but do not improve comparability or reliability. Moreover, given that non-financial environmental disclosure is less standardised than mandatory financial reporting disclosure its reported qualitative characteristics substantially depend on the preparer. From the users' perspective, as briefly mentioned in subsection 3.1.3, although they have been documented as wishing to obtain comprehensive qualitative information in the case of financial reporting and hence, this is assumed to be the case for CER, they have no means of checking whether this is the case. Therefore, it is worth investigating whether each of the four qualitative characteristics of CER exhibit dissimilarity in their level of employment, thus resulting in a lack of balance and an imperfect extent of correlation.

In addition, given that the measures of CER employed in prior studies were developed under the unifying concepts which relied on the disclosure as a whole, it is reasonable to assume that these four qualitative characteristics move together. To test research question 1, the following hypotheses are drawn up:

H1.1: The levels of usage of each qualitative characteristic: understandability, relevance, reliability and comparability and consistency are substantially different in CER and although there is correlation between each of them, this is imperfect.

H1.2: The four characteristics are positively correlated.

3.3 Determinants of Variation in the CER Quality from Motivational Theories

In the previous section, a theoretical framework of the dimensions of quality in terms of the qualitative characteristics of CER was developed. Building on this framework, it is suggested that variation in the quality of CER, thus measured, may be attributed to factors that have previously been observed to be influential in corporate voluntary environmental disclosure decisions. This section discusses such possible determinants based on the motivational theories discussed in the previous chapter, through the development of further research questions and hypotheses. This also includes reviewing the firm-specific determinants of CER, their proxies as used in the previous empirical studies, and their expected relationships with the quality of CER. In addition, there is a short discussion of the environmental performance, accounting system and the control variables, which may contribute to explaining variation in CER disclosure quality.

Following the first research question enquiring whether CER provides quality for users' decision making, therefore, the question is further probed for this thesis to establish whether or not the variation in CER quality can be explained by the motivational theories of voluntary disclosure. Recall the possible dissimilarity in level of usage of each of the four main qualitative characteristics, as discussed in the previous section. That is, it may well emerge in the empirical analysis that there is a lack of balance in CER and hence, less than optimal quality and if this is the case it will prove fruitful to investigate the causes of this by considering the different components of each main

characteristics for the identified motivations elicited in chapter 2. In this regard, in seeking to explain the variation in disclosure under the different theoretical perspectives, previous studies have documented the effects of: company size, industry, country of origin and profitability in voluntary environmental disclosure. Therefore, the question raised in this study is whether the quality of environmental reporting can be shown to be associated with such corporate characteristics.

Consistent with stakeholder theory, some literature has concluded that a high volume of disclosures is associated with companies that face more environmentally concerned stakeholders. Therefore, corporate characteristics, which may influence the degree of environmental concerns from external agents, are included in the empirical investigation as possible factors influencing the variation in CER. In addition, as the literature which relies on legitimacy theory shows, studies have mostly concluded that companies' CER strategies are indeed motivated by the intention to gain legitimacy. In this regard, the corporate characteristics of: large size, high profitability, country of operation with great environmental concerns and membership of an environmentally sensitive industry, have been identified as the main features that lead to firms being under the spotlight in relation to their CER (Adams et al., 1998; Adams and Kuasirikun, 2000; Clarke and Gibson-Sweet, 1999; Neu et al., 1998; van der Laan Smith et al., 2005). That is, under this lens it is purported that firms having this bundle of characteristics are more focussed on their CER than those who do not. In line with the above discussion, the following research question is developed and each element contained within it is considered separately in detail below.

Research Question 2:

Is there any relationship between the following firm-specific factors and a) the overall quality of CER b) each quality characteristic of CER? If so, is relationship consistent with motivational theories?

- Firm-specific determinants: organisational size**,** industry sector, country of domicile along with, the breadth of ownership, in terms of cross-listing of shares, the extent of international global operations and the financial performance of the company

3.3.1 Firm-Specific Determinants

This subsection contains a brief review of existing empirical work regarding the effects of a firm's characteristics on CER. The variables included here are the proxies that appear most commonly in the research on social and environmental disclosures, for they have been shown to operationalise the motivational theories in explaining variations in CER.

Organisational Size

Company size has been raised in several studies as being a correlate of the amount or extent of environmental disclosure (e.g. Adams et al., 1998; Belkaoui and Karpik, 1989; Brammer and Pavelin, 2004, 2006b; Clarke and Gibson-Sweet, 1999; Gray et al., 1995; Hackston and Milne, 1996). More specifically, in accordance with the stakeholder and the legitimacy theory arguments, these researchers contended that corporate size (as measured by a firm's total asset or market capitalisation value) is positively related to environmental responsibility activism and/or provision of environmental information, in that larger companies are likely to cause more impact by their operations on the natural environment and hence are more likely to be scrutinised and subject to socio-political pressure from investors and other external interested parties. Referring briefly to the surveys (e.g. KPMG, 2002, 2005), large companies tend to publicise their information about social and/or environmental activities via company financial reports and/or stand-alone social and/or environmental (or sustainability) reports (KPMG, 2002, 2005). Given this situation, as regards the quality of corporate disclosures of environmental information, company size is therefore introduced here as a variable explaining variation in disclosures, with a positive relation being expected between it and the environmental disclosure quality. The following hypothesis is proposed.

H2: The higher the quality of CER, the larger the company.

Industry Sector

Studies based on the stakeholder and legitimacy theories of motivations for CER have suggested that companies from industries which are considered to have a high pollution propensity tend to have high levels of public exposure about environmental issues, thus being intensively scrutinised from investors and other environmental stakeholders, and consequently in response are more likely to provide extensive environmental disclosure of their environmental information in relation to: impact, performance, spending, and/or policy, than companies from less environmentally emitting sectors (e.g. Campbell, 2004; Clarke and Gibson-Sweet, 1999; Deegan and Gordon, 1996; Deegan et al., 2002; Patten, 1991, 2002a, 2002b). Some reporting guidelines, such as those of GRI (2003, 2005a, 2005b, 2006a, 2007, 2008a, 2008b) and DEFRA (2006), have indicated that industries differ with regards to their environmental impacts. Therefore, the next step to consider is whether there is an association between environmental group concerns about particular industries and the quality of environmental disclosures.

Prior studies provide a guide as to what types of industry appear to be critically visible of environmental issues, revealing that: power generation (e.g. Clarke and Gibson-Sweet, 1999), chemicals (e.g. Adams and Kuasirikun, 2000; Clarke and Gibson-Sweet, 1999; Clarkson et al., 2008; Deegan and Gordon, 1996; Hoffman, 1999; Patten, 1991, 2002a), mining (e.g. Clarke and Gibson-Sweet, 1999; Clarkson et al., 2008; Deegan and Gordon, 1996; Deegan et al., 2002), pulp and paper (e.g. Clarkson et al., 2008) and oil and gas (e.g. Clarke and Gibson-Sweet, 1999; Clarkson et al., 2008; Deegan and Gordon, 1996; Patten, 2002a; Unerman, 2000) have great environmental damage propensity. By contrast, the service industries, the high technology sector and the manufacture of household products, have been considered as producing lesser environmental pollution and, therefore, are assumed to be less subject to stakeholder strains about their environmental impacts and activities as well as their disclosure practice (e.g. Brammer and Pavelin, 2006a; Deegan and Gordon, 1996; Roberts, 1992). Several literatures have employed a binary method of sectoral classification, e.g. between the extremity of one sector against all others, such as in the petroleum/chemical industries vs. others in Hackston and Milne (1996), thus implying that the latter are all environmentally less sensitive sectors. This approach is problematic as there is no general consensus as to which sectors are environmentally sensitive and which are not. Consequently, as is explained in chapter 4, use of the international classification of industrial sectors, i.e. International Standard Industrial Classification of All Economic

Activities Revision 3.1 (ISIC Rev.3.1) (United Nations, 2002) is deemed to be more effective for the empirical analysis, as this will provide more detailed comparable results. In relation to this, the following is hypothesised.

> *H3*: The quality of CER is higher in industries associated with prominent environmental issues.

Country of: Domicile, Shares Listed and Operation

The degree of environmental activism in the country that the company originates from, is owned by, and/or operates in, has been proposed as having an influence on the volume and extent of environmental practice in some previous studies (e.g. Adams and Kuasirikun, 2000; Gamble et al., 1996; Guthrie and Parker, 1990; Ho and Taylor, 2007; Holland and Boon Foo, 2003; van der Laan Smith et al., 2005). In this regard, taking a political economy theory perspective, Guthrie and Parker (1990), as pioneers on the study of environmental disclosure based on inter-country differences, claimed that the legislative environment and public pressures for information about a firm's social and/or environmental impact, produce different disclosure responses in terms of the content themes, in the: US, UK and Australia. Given the underlying cultural similarities, their findings failed to elicit an explanation for the other differences in social and environmental disclosures between: the UK, the US and Australia. However, they did discover that many (particularly in the UK) disclosures were minimalist in nature in that they provided as little as possible information within the law and this would suggest that a mandatory requirement restrains environmental disclosures. Wider international comparisons have been made by Gamble et al. (1996) and their evidence indicates that extra environmental information presentations to those specified in the regulatory requirements are observed in countries that have high levels of social consciousness and/or developed capital markets (Gamble et al., 1996). Moreover, after focussing on the disclosures of economically internalised costs they found two financial accounting models that could explain the extreme diverse practices in relation to environmental disclosure, a matter returned to below.

Based on the socio-political theories, the evidence of Adams and Kuasirikun (2000) and Holland and Boon Foo (2003) has also suggested that the nature of regulations demanding environmental responsibility in different countries as well as other external pressures, especially in developed countries, determines the extent and amount of corporate voluntary disclosure. However, when comparing these two studies, in the latter, pertaining to the US and the UK, it was concluded that the regulatory frameworks can be viewed as a manifestation of the culture and the more litigious the environment then the less the disclosure, whereas in the former, which involved comparing the UK with Germany, an explanation was alternatively made, whereby the greater the extent of the regulations demanding ethical responsibility in the latter country led to more disclosure. Therefore, there is no common explanation for the observed variations and thus, this requires further investigation.

Some studies (e.g. Deegan, 2002) extended this legislative perspective to include the borrowing requirements and community expectations among different countries, as other reasons that can shape corporate environmental disclosure. van der Laan Smith et al. (2005) found relatively similar results in relation to social and/or environmental disclosure when analysing and comparing the annual reports of electric power generation firms in the US with those from Norway and Denmark. More specifically, their results revealed a significant difference, albeit only for the largest firms, between the two, with respect to their social and/or environmental disclosure levels, with those large firms from Norway/Denmark being found to provide higher levels of disclosures than those from the US (van der Laan Smith et al., 2005). Under the stakeholder theory perspective, they interpreted the disclosure variation as a reaction to the different magnitude of the existing demands from stakeholders on social and/or environmental issues. Similarly, focussing on countries with differences in national cultures, regulatory arrangements and financing arrangements, namely the US and Japan, Ho and Taylor (2007) used the disclosure indices on the comprehensiveness of content, closely following the GRI (2002) Guidelines and found that variation in levels of voluntary environmental disclosure appears to be related to differences in cultural characteristics regarding environmental activism and in the legislative situation for environmental disclosures. In other words, their results support those of Holland and Boon Foo (2003), but using a different approach and referring to rules and requirements regarding the reporting of environmental information rather than environmental laws and regulations

influenced by cultural aspects, when the differences in regulatory arrangements were considered.

Further, when a firm's shareholders include those that are foreign, it may be the case that they reflect wider pressures for a firm in relation to its information disclosure. That is, a firm would enhance its CER level when there is wider share ownership of this nature, because it may well be the only source of information available on such matters for these shareholders (Cormier et al., 2005). However, this matter in relation to the extent of ownership may be dependent upon the particular country of origin of a firm. In this regard, Cormier et al (2005) empirically found a negative relationship between foreign ownership and the extent of environmental disclosure in German companies, which they attributed to that country having greater environmental concerns than many others.

In addition, when multinational corporations operate in developing countries, such as Nigeria and Brazil (see for example, Unerman and Bennett, 2004), so as to exploit their resources, their environmental impact can be a major concern to stakeholders. That is, they have to decide the degree to which they demand that the company takes account of its environmental effect in the overseas investment. In fact, this holds true for any operation outside of the home country, but perhaps not to such a great extent, because developed countries have their own legislation that needs to be complied with. Moreover, such operation abroad simply reflects the greater breadth of the potential stakeholder based outside the home country. Therefore, apart from country of origin and of ownership, the international extent of a firm's operations may provide an explanation for the differences in environmental disclosure. Regarding this, referencing the results from several comprehensive global surveys of corporate social and environmental reporting (e.g. KPMG, 2002, 2005), it was found that there are differences in the social and environmental reporting levels and the reporting content themes at the national level, with Japan and the UK being cited as the two top countries (KPMG, 2005). The surveys also provided explanations, after detailed disclosure analysis, for the reporting variation among various countries (which were grouped per region), which they found range from being driven by: shareholders, stakeholders or by compliance with legislation.

In view of these matters, it is hypothesised as follows.

H4.1: The quality of CER is higher if the company has domicile in a country that: has high levels of environmental consciousness, is more exposed to environmental concerns, and has less of a legislative preference.

H4.2: The quality of CER is higher if the company has shares listed in another country(ies) apart from its country of domicile.

H4.3: The quality of CER is higher if the company has substantially operated (generated revenue, gained operational profit, or held net assets) abroad.

Financial Performance

Similarly to firm size, better financial performance has been associated with higher exposure to public pressure for corporate disclosure in previous studies (e.g. Gray et al., 2001; Neu et al., 1998). Other researchers have claimed that it works differently, in that firms with strong finances are able to fund environmental activism (e.g. Ullmann, 1985; Logsdon, 1985; Yu and Bell, 2007) by enhancing positive social and environmental performance (Waddock and Graves, 1997) as well as this motivating them to increase the extent of environmental related information disclosure (Roberts, 1992). Moreover, the quality of the disclosure is expected to mimic these behaviours regarding the disclosure level. In support of this view, McWilliams and Siegel's (2001) pointed out that implementing strategies for environmental management can be costly and therefore, a company's financial condition could be expected to play an important role in relation to being able to cover the costs of applying environmental initiatives. This investment could enhance efficiency in environmental performance in such a way that ultimately drives managers to disclose, explicitly, good quality environmental information. In relation to this, using a cost-benefit concept, Brammer and Pavelin (2006a) and Cormier and Magnan (1999) proposed that a company's financial condition determines its ability to support the costs of preparing and providing corporate environmental information, with profitability being selected as the measure of a company's financial performance.

However, the empirical results of Brammer and Pavelin (2006a, 2006b) revealed no association between profitability and environmental disclosure.

Regarding the empirical evidence in the extant literature on the relationship between finance and disclosure, several studies have found that environmental disclosure is not related to profitability in the same period (Belkaoui and Karpik, 1989; Ingram, 1978), but to profits in the previous period (Roberts, 1992). However, not all studies have supported this lagged profit-disclosure relationship. For example, Hackston and Milne (1996) and Patten (1991) found no relationship between profitability and social and/or environmental disclosure, even when both profitability in the previous and same period were used as the measures of financial performance. Similarly, in more recent work, as briefly mentioned above, no relationship between lagged profits and environmental disclosure was found in Brammer and Pavelin's (2006a, 2006b) results. In contrast, several empirical studies have provided evidence that same-period profitability is significantly and positively correlated with a company's environmental disclosure (e.g. Cormier and Magnan, 1999). As to using the non-lagged profit as independent variable, Neu et al. (1998) and more recent evidence (e.g. Ho and Taylor, 2007), has suggested there is a negative relationship between the two. The mixed results produced give good grounds for re-examination of the association between the two, but disclosure in terms of quality and not volume or information extent is to be the focus here. However, this researcher, in accordance with some recent studies, assumes that a firm's reaction to its financial exposure or resource availability in terms of its environmental activism, especially regarding disclosure, takes place within a year. So as to address research question 2, the following hypothesis is proposed.

H5: The higher the quality of the CER, the more profitable the company.

3.3.2 Environmental Performance

When considering the stakeholder and legitimacy motivational theories of CER, it is to be expected that corporate disclosure of environmental information depends upon the record of its environmental performance. As reviewed in the previous chapter, the empirical findings from several studies (e.g. Al-Tuwaijri et al., 2004; Brammer and

Pavelin, 2004; Clarkson et al., 2008) have elicited that good environmental performance is significantly associated with more extensive environmental disclosures, thus implying a keenness for a company to report only good news (or improved/positive performance) and to avoid reporting bad news (or worse/negative performance) as much as possible. However, some empirical research has found no significant association between environmental disclosure and performance (e.g. Rockness, 1985; Wiseman, 1982), whilst others have found a negative relationship between the two (e.g. Brammer and Pavelin, 2006a, 2006b; Cho and Patten, 2007; Hughes et al., 2001; Patten, 2002a). By way of explanation for this, the argument goes that, if there is poor environmental performance, as in the case of the BP oil spillages in 2010, the company has to disclose as much information as possible so as to avoid losing its legitimacy. In sum, although there is some evidence of a relationship, prior research has not found a consistently significant association between environmental performance and disclosure, especially as regards its sign, perhaps because of the inconsistent measures of environmental performance applied (as discussed in the previous chapter). With the focus being on the disclosure quality the following research question is put forward.

> *Research Question 3*:
> Is there any relationship between environmental disclosure quality and environmental performance and if any, is this consistent with motivational theories?

That is, by addressing this research question, in this study the relationship between the two is re-examined. Based on the legitimacy theory perspective that there is disclosure preference, if a firm makes a positive contribution to the environment, the following hypothesis is proposed:

> *H6*: The higher the quality of CER, the better a company's environmental performance.

3.3.3 Accounting System

The nature of the country's financial accounting system, as briefly discussed earlier in subsection 3.3.1, might influence voluntary non-financial reporting practices. With

respect to this, it has been suggested that this additional country characteristic could potentially provide an explanatory account for variation in the disclosure practices in several studies e.g. British-American accounting model countries vs. Continental accounting model countries in Gamble et al. (1996), German vs. UK accounting systems in Adams and Kuasirikun (2000) and US vs. Japanese reporting conditions in Ho and Taylor (2007).

Gray (1988) characterised accounting systems on the basis of the measurement practices used and the extent of information disclosed, along two facets: conservatism vs. optimism, in the approach to measurement and secrecy vs. transparency attitude, in the disclosure of information. However, several financial reporting studies, especially those subsequent to the accounting scandals (e.g. Beattie and McInnes, 2006; Benston et al., 2006) have highlighted other differences in the accounting systems that lead to variation in the level of voluntary financial information disclosure of the firms. More specifically, they have pointed out that rules-based and principles-based accounting systems, in particular, in relation to the US and the UK, respectively, considerably influence this. According to Gray's characterisation, accounting practices in the UK and the US, both powerful economic forces, seem to fall into the same dimension, that of optimism and transparency (Gray, 1988). Nevertheless, differences between these two have been commented upon. For instance, the financial reporting framework within the US, in particular for listed companies, is more stringent than that in the UK (Beattie and Jones, 1997). In this regard, a number of detailed accounting standards and mandatory disclosure requirements in relation to a 10-K report of the Securities and Exchange Commission (SEC) are required in the US, whereas there is "no UK equivalent to the SEC…statutory accounting provisions" (Beattie and Jones, 1997, p.40) and less detailed standards. Both Beattie and Jones (1997) and Beattie and McInnes (2006) reported empirical findings in relation to informational disclosure of the UK and the US firms that higher quality or more financial information is evidenced for a rules-based reporting system than with principles-based one. In other words, prior financial reporting studies have found a difference between reporting under a rules-based system (the US reporting) and that under a principles-based system (the UK reporting), with the former appearing to support greater voluntary financial information disclosure than the latter.

When it comes to voluntary non-financial disclosure, this aspect of bilaterally comparative international research, in particular that regarding the US and the UK, has been relatively neglected. Study of the comparative voluntary disclosure of these two countries has been conducted by Gamble et al. (1996), but the scope of this study was multilateral, rather than bilateral. Using the accounting practices' classification of Gray (1988), they found empirical evidence for a sample of 27 countries that the financial reporting standard has a strong impact on the level of diversity in environmental reporting practices. Some bilateral studies regarding variation in the range and extent of environmental disclosures in other contexts (Adams and Kuasirikun, 2000 and Ho and Taylor, 2007) have linked the accounting system in the country where the disclosures are made to differences in such reporting. However, common interpretations for the observed variations was not forthcoming, and hence, the debate on this is still ongoing. That is, the former noted a greater volume of reporting by German firms compared to those in the UK, which is in contrast to Gray's (1988) characterisation of accounting systems, whereas the latter revealed a greater level of disclosure by Japanese firms than those of the US, using the difference in disclosure rules and requirements on environmental issues in relation to environmental liabilities.

Both the UK and the US have well developed reporting requirements, in particular, those relating to the treatment and disclosure of a number of financial environmental issues are mandatory in the financial statements. In the UK, financial environmental involvement is covered by existing UK accounting standards. For example, these pertain to: valuation and reporting of tangible and intangible assets including the measurement of inventories affected by environmental impairment and financial provisions for possible liabilities arising from waste disposal, pollution, decommissioning and restoration expenses, etc. Similarly, the disclosure of certain environmental liabilities is required in the US (Ho and Taylor, 2007). More specifically, disclosure of listed firm environmental expenditures and liabilities in the 10-K, the security filing, is required by the SEC, as a result of the passing of the United States. *Sarbanes-Oxley Act of 2002*. Further, stipulations on environmentally-related liabilities, particularly on corporate obligation for remediation, are provided in the American Institute of Certified Public Accountants (AICPA)'s Statement of Position 96-1 (AICPA, 1996). In addition, accounting for contingencies, as directed by the FASB

(1975) was established and includes the issues of capitalisation of costs related to site contamination liabilities.

Given the similar disclosure requirements mandated by the GAAPs and/or the securities commissions, differences between the UK and the US disclosures of environmental information internalised in financial statements would not be expected. However, the interest here lies in those areas that are voluntary and non-financial, which are not covered by any such financial disclosure requirements or any other standards, for both countries.[8] The influence of the financial accounting system (rules- or principles-based) on voluntary environmental disclosure is, therefore, worth exploring as to whether differences in disclosure practice arise. That is, this raises the issue of whether the levels of voluntary environmental disclosures, indirectly bounded by rules-based or principles-based financial accounting systems, vary or not. Regarding this, it is predicted that in the absence of reporting rules and regulations, as is the case in non-financial environmental reporting, the nature of the financial system will have an impact on its level and hence, reflect contrasting attitudes towards it.

More specifically, it is expected that under voluntary reporting circumstances, companies under a rules-based financial reporting system, driven by a legislative orientation, tend to provide less voluntary non-financial environmental information, whereas those under a principles-based one are more likely to proffer a higher level. This projection is the opposite to the empirical findings of financial reporting, discussed above. This leads to an addition research question and a further hypothesis:

Research Question 4:

Is there any difference between CER quality in different countries that use substantially different financial accounting regimes (the US vs. the UK in particular)?

[8] Although, for UK listed companies, there is mandatory disclosure of actual environmental impacts in s.417 of the Act (Great Britain. *Companies Act 2006*), which was passed so as to comply with the EU Accounts Modernisation Directive (EU AMD) and came into force on 1st October 2007, under this act, there are no set guidelines for how this should be done.

H7: The quality of CER is higher if the company has domicile in a country that mainly uses a principles-based financial accounting system (the UK) than in a country that mainly uses a rules-based financial accounting system (the US).

3.3.4 GRI Guidelines Application

There are widely accepted CER reporting guidelines, but it is those of the GRI that have increasingly become used in the research to measure environmental disclosure (e.g. Clarkson et al., 2008; Ho and Taylor, 2007; Lynch, 2010). Nevertheless, as discussed in the previous chapter, the various methods of the disclosure being used in these studies have relied on the extent of the disclosure content taken from the guidelines, rather than the disclosure quality. That is, even though dichotomous and/or ordinal scales have been used to represent certain information as quality criteria of the disclosure, as explained in chapter 2, the use of such criteria has been restricted to the information content in the framework or guidelines used. However, despite no universal reporting guidelines being used, it is worth considering whether the environmental disclosure practices that have been prepared following such guidelines possess qualitative features, and if so, to how much variation exists between the identified quality characteristics. Moreover, incorporating the application of the guidelines for corporate information reporting into the examination of the determinants of CER quality variation, as a control variable, can shed light on their level of practicality and provide insights for their improvement. Therefore, the following research question and hypothesis are proposed.

Research Question 5:
Do the GRI Guidelines enable qualitative attributes in environmental information to be disclosed?

H8: The quality of CER is higher if a company applies the GRI Guidelines as their environmental disclosure discipline.

3.3.5 Independent Environmental Ratings

Owing to an increasing awareness of corporate environmental impact and responsibility, several independent environmental ratings of CER and performance have been developed by organisations, e.g. the AccountAbility Rating, FTSE4Good and the DJSI, for assessing a firm's environmental responsiveness. Moreover, previous studies have claimed that to gain or maintain its legitimacy the extent of a firm's disclosure reflects its environmental responsiveness, as evaluated by these external ratings. In this regard, a positive correlation between the independent ranking and the level of disclosure was found in van Staden and Hooks (2007). A positive relation was also evidenced in Clarkson et al. (2008), when they calibrated a firm's environmental responsiveness, as its propensity to receive favourable/unfavourable press articles related to the environment against disclosure.

In addition, as discussed in the previous chapter, a range of external ratings have been employed in prior studies that examine the motivations for environmental disclosures (e.g. Belkaoui and Karpik, 1989; Brammer and Pavelin, 2004). In these works, a variety of external ratings have been used as measures of firm environmental performance and the disclosures were assessed on their extent. These researchers concluded that the positive correlation found between the external ratings and the disclosures serves to support the legitimacy theory argument that a firm selectively includes only its positive environmental involvement in its disclosure.

Consequently, this researcher posits that incorporating independent ratings for environmentally related issues as a control variable into an investigation of the motivations for CER quality, will contribute to the literature in that it is expected that the disclosure variation, in terms of its quality, can be explained in accordance with legitimacy theory. Moreover, this could illuminate upon the compatibility of an independent assessment with a firm's disclosure quality as measured in this study. Accordingly, the following research question and hypothesis are developed.

Research Question 6:

Is the corporate environmental disclosure quality which results from the objective measures of quality of this study consistent with independent ratings' findings, and if so, can the association be explained by motivational theories, legitimacy theory in particular?

H9: The quality of CER is positively correlated with that measured from independent rating organisations.

3.3.6 Year

It is obvious that environmental issues are ongoing matters, as is evidenced in the perpetual revision of the reporting guidelines. For example, the GRI Guidelines, the most widely accepted CER reporting guidelines, have been updated consistently every 2 or 3 years, with the latest version available at the commencement of this study being that for 2006 (GRI, 2006b). In addition, in the same year the DEFRA reporting guidelines for UK business (DEFRA, 2006) were also introduced. Taking into account these developments over time, it is considered that it would be fruitful to investigate the trend in quality, both in absolute terms as well in relation to any variation in the use of the four identified qualitative characteristics. With regards to this, it is expected that the enquiry into quality level across years will reveal increased awareness by firms in reporting their environmental information. Therefore, reporting year, which acts as a control variable, is incorporated into an examination of the CER motivations. Accordingly, the related research question and hypothesis are as follows:

Research Question 7:
Does the level of quality characteristics in the disclosure practices over time reflect an increasing awareness of environmental issues?

H10: The quality of CER is positively correlated with reporting year.

Furthermore, in order to extend the investigation into trends, institutional contexts that drive corporate environmental disclosures are also considered. As discussed in the previous chapter, mimetic behaviour per institutional theory refers to the situation in a particular sector where the leading or modelling organisations may influence others in adopting similar policies and procedures in environmental disclosure practices (DiMaggio and Powell, 1983). Additionally, regarding coercive behaviour as per institutional theory, an organisations' subsequent period of CER may be influenced by

its own existing environmental practices (DiMaggio and Powell, 1983). Therefore, it can be hypothesised that such behaviours may hold true for environmental disclosure quality. The review of literature in the previous chapter has shown that to date there has only been one study clearly testing these behaviours (i.e. Cormier et al., 2005); however, the measure of the environmental disclosure in this study largely relied on the extent of information content. In this regard, hence, it would be beneficial to seek evidence for these behaviours in accordance with institutional theory as manifested by quality of the disclosure. A two part hypothesis in relation to this is proposed as follows.

H10.1: The company quality of CER is positively correlated with that in the previous year as well as that of benchmark companies in the industry in the previous year, across the study period.

H10.2: The company quality of CER is positively correlated with that in the previous year as well as the degree of a discrepancy between that in the previous year and that of benchmark companies in the industry in the previous year, across the study period.

3.3.7 Relationship between Financial and Environmental Performance

So as to address the issue of reporting motivation, the relationship between forms of performance, i.e. financial and environmental is being considered, since it is another research area of corporate environmental responsibility that has not received much attention. Up to the present, there has been a continuing debate about the causal nature of this relationship. On the one hand, it has been argued that it is positive owing to the availability of a financial resource effect on corporate environmentally activism (Ullmann, 1985; Waddock and Graves, 1997). On the other hand, others have also postulated that there is a positive relationship between the two on the basis that one would expect a company with more superior environmental performance to be keener to present their improved/positive environmental performance in CER, with the intention of achieving higher financial performance (Hart and Ahuja, 1996; Orlitzky et al., 2003).

Previous attempts to determine the relationship between the two forms, albeit largely undertaken regarding the latter stance, have produced inconclusive results. With regards to the resource driven evidence, Waddock and Graves (1997) and Jaggi and Freedman (1992) found a positive relationship between the two, using lagged financial performance data. Moreover, both these studies found evidence to support the notion that environmental performance is influential on financial outcomes. By contrast, Cordeiro and Sarkis (1997) elicited a negative relationship between environmental performance and short-term subsequent profitability, whilst Hart and Ahuja (1996) and a more recent study by Orlitzky et al. (2003) provided further results in support of their being a positive link between the two. Al-Tuwaijri et al.'s (2004) empirical work also indicated a weakly positive relationship between the two, but it employed only non-lagged environmental performance to investigate its impact on market-based economic performance. However, McWilliams and Siegel (2000) found a neutral significant effect of averaged annual social and/or environmental performance on the averaged annual value of profitability over the same 5-year period.[9] Moreover, Freedman and Jaggi (1992) discovered no significant association between a firm's environmental performance and subsequent financial performance. The variability of these results is perhaps due to the different methodological approaches employed, both for the environmental performance (as discussed in the previous chapter) and financial performance measures.

With regards to the above empirical studies, except for a meta-analysis by Orlitzky et al. (2003), most of these papers suffer from data constraints as they have been limited to studying such a relationship only for US companies. Moreover, accounting-based data, e.g. return on sales, return on assets (ROA), return on equity (ROE), net income, or earnings per share (EPS), have been used as proxies for financial performance in some studies (e.g. Cordeiro and Sarkis, 1997; Freedman and Jaggi, 1992; Hart and Ahuja, 1996), whereas others have pointed to the weaknesses of using accounting ratios, because their compilation across firms is inconsistent and hence, have employed market-based economic performance measures instead (e.g. Al-Tuwaijri et al., 2004). Orlitzky et al.'s (2003) meta-analysis considered studies that have used both

[9] A positive impact of social and/or environmental performance was found when investment in research and development was excluded from their empirical analysis, but they argued that doing so would result in misspecification of the model.

accounting-based (such as ROA, ROE or EPS) and market-based indicators (e.g. share price or share price movement) of financial performance, when they elicited the positive relationship described above.

Overall, it appears that studies of the relationship between environmental and financial performance have: produced inconclusive results, and used various measures of firm financial and environmental performance. Under the circumstances, so as to address the issue of disclosure motivations in addition to the above variables, this researcher reinvestigates the correlation between company financial performance and environmental performance. Following this, the focus shifts to investigating the effects of environmental performance and disclosure in terms of quality on the subsequent year's financial performance. Regarding this, given that previous studies examining the relevance of disclosed information have largely overlooked non-financial stakeholders, as discussed in chapter 2, an accounting-based financial performance measure that caters for these other stakeholders is embraced rather than a market-based one that would ignore their perspective. The related research question and hypotheses are as follows.

Research Question 8:
Are the financial performance and environmental performance of a company correlated?

H11: The financial and environmental performance of a company are positively correlated.

H11.1: Environmental performance is better, the greater the profitability of the firm.

H11.2: The greater the financial performance, the better a company's environmental performance and/or its CER quality.

3.4 Chapter Summary

In this chapter a framework has been developed to determine the quality of environmental disclosure, which has involved the adaptation of qualitative characteristics of financial reporting. Moreover, so as to establish its validity and supremacy, this CER quality framework has been devised to analyse the potential factors influencing the variation in quality of the disclosure, in view of the relevant social-political theories, namely the: stakeholder, legitimacy and institutional theories, by drawing upon both financial reporting frameworks and non-financial guidelines. That is, the aspects of quality and total quality in CER reporting are used as proxies for a firm's practice, a strategy that has been applied in much previous research, albeit for different dimensions of the relation between business and society. Therefore, the framework contributes to the literature in this research area by its use of qualitative measures of the disclosure, rather than volume- or extent of information content-based ones pertaining to the vast majority of previous studies.

Initially, a comparative analysis of three different financial reporting frameworks, i.e. the UK ASB (1999), the US FASB (1980) and the IASB (2001), and the non-financial most widely used GRI Guidelines (GRI, 2006b), was made, revealing that there are a number of similarities between financial and non-financial characteristics. Moreover, although there are some differences among them, perhaps owing to the different nature of information required, it has been concluded that financial reporting qualitative characteristics and the concept of decision-useful information can be adapted for non-financial reporting. In addition, the different characteristics of non-financial information are also considered as being important. In sum, it has been posited that the quality of the CER comprises four main characteristics: understandability, relevance, reliability and comparability and consistency and that each of these four characteristics contains a specific, usually distinct, set of elements. Moreover, it has been claimed that as deemed necessary in the case of financial reporting, there should be a balance between these four main characteristics in order to satisfy the decision-making needs of non-financial information users.

For this investigation into the determinants of variation in the CER quality, drawing upon multi-theoretical lenses, the quality of environmental information disclosure of firms is assumed to be determined by the firm-specific characteristics of: size, industry sector, country of domicile, cross-listing of shares, the extent of international global operations and financial performance. In addition, on a similar theoretical basis, environmental performance has been shown as being one of the disclosure quality determinants. A number of previous empirical studies have evidenced some relationship between the above firm-specific characteristics and corporate environmental disclosure, but the results have been contrasting. For example, there has been no conclusive empirical evidence for the relationship signs, if any, in the case of the firm financial performance and environmental performance effects on CER. It is therefore worth retesting these relationships empirically and this is the subject of the next chapter.

The investigation has been extended to include the nature of the country's financial accounting system (represented by the rules- vs. principles-based accounting systems of the US and the UK, respectively), with an expectation that a principles-based accounting system induces firms to voluntarily disclose more quality of their CER. In addition, the use of the GRI Guidelines in relation to reporting, independent environmental ratings and reporting year, have been included in the investigation of CER motivations as control variables, so as to obtain more robust findings regarding the factors that influence the quality of CER, than were they excluded. The work has been subsequently further expanded to take into account the perspective of mimetic and coercive behaviours as per institutional theory, whereby firms are expected to disclose their environmental information following their sector leader or competitors and their own existing practices. A few studies have examined institutional theory-based behaviours in CER, but these researchers used volume- or extent of information content-based measures of disclosure. Hence, by empirically testing CER quality using the devised framework it is posited that a more comprehensive measurement of the phenomenon will be elicited than hitherto, in particular, because it is rooted in accounting procedures that have been thoroughly tested in financial reporting rather than the highly subjective measures described in detail previously.

Finally, it has been noted that a number of researchers have posited that firm environmental and financial performance may have some relationship and also that

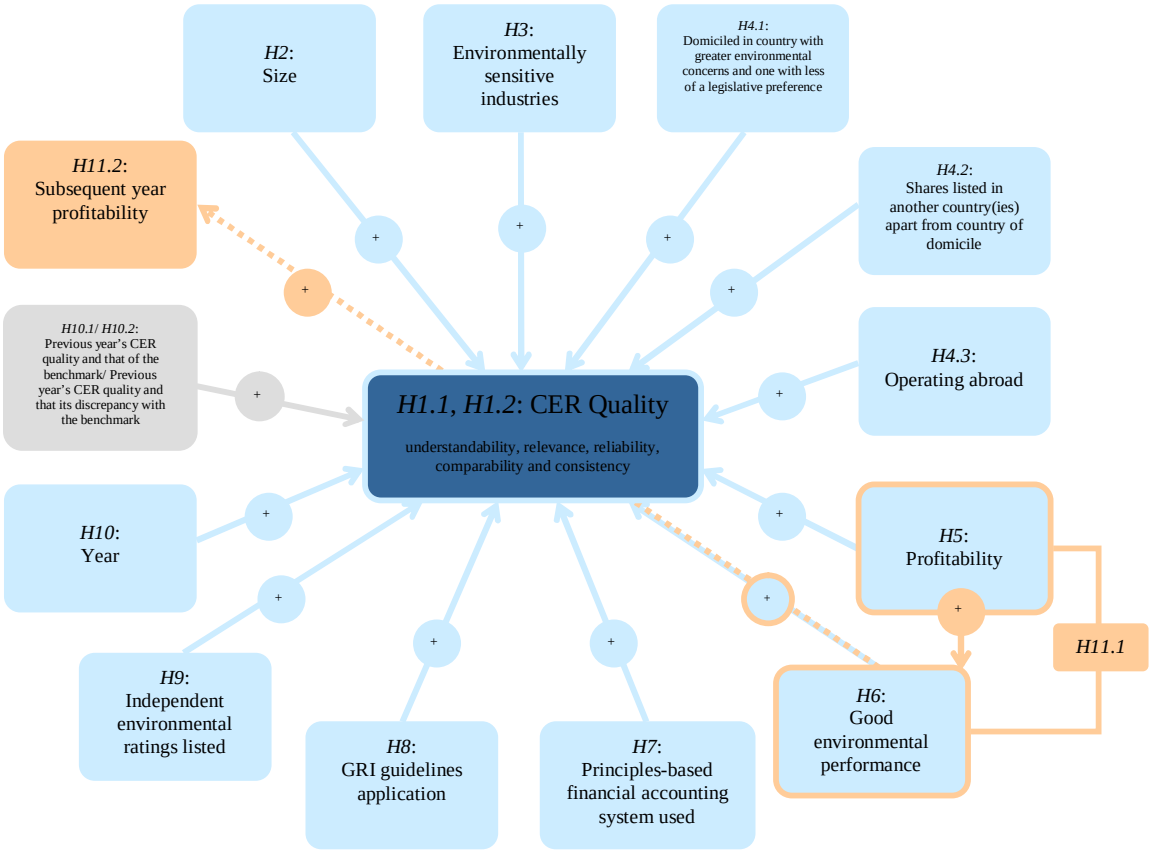
there is still a continuing debate about the causal nature of it. With regards to this, it has been argued that a firm with high profitability possesses a slack financial resource to invest in an environmental improvement campaign so as to enhance its performance in this area. Alternatively, others have stated that good environmental performance may increase a firm's financial performance owing to stakeholders' perception effect. The prior empirical evidence has shown inconclusive results regarding whether this correlation exists and if so, what is its sign and therefore it is considered to be productive to re-examine empirically the casual relationship between the two. However, to address the issue of the disclosure motivations, the focus here is on the effects of environmental performance and disclosure on financial performance of a firm. In other words, the aim here is to find evidence of the value-relevance of a firm's environmentally-related information and performance to users' decision making.

Having developed a framework of CER quality as well as constructing research questions and hypotheses for the thesis so as to guide the empirical investigation, the next chapter explains and justifies the methods used.

4 Empirical Method

In this chapter, the methods adopted in the empirical part of the study to investigate the research issues and test the hypotheses established in the previous chapter, as summarised in figure 4.1, are presented and justified.

Figure 4.1: Hypotheses Tested in the Empirical Investigation



Essentially, the empirical investigation entails statistical tests and regression analyses involving measures of CER quality for a sample of firms. The concept of quality is based on the qualitative characteristics of useful financial information, as explained in chapter 3, each of which is measured through content analysis.

As described in section 4.1, the sample is selected to obtain the cross-sectional and temporal coverage necessary for testing hypotheses as to the potential influences of industry/sector, country of domicile (and thus accounting system) and time on CER quality. This section also explains the restrictions on the sample for certain analyses due

to the more limited coverage of firms in the Carbon Disclosure Project (CDP) database, which was used to obtain data on carbon emissions as the basis of a measure of environmental performance. Furthermore, the types of corporate reporting media employed in the content analysis are defined in this section.

Measures of CER quality were obtained as primary data from content analysis of the relevant source material, which involved the coding and scoring of disclosures, thus enabling measures of quality to be represented through aggregate figures comparable across the sample. This general approach has been widely employed in studies of CER (see, for example, Wiseman, 1982; Gamble et al., 1996; Cormier et al., 2005; Cho and Patten, 2007), but in this instance novel methods of measuring CER quality are employed for the four component characteristics: understandability, relevance, reliability and comparability and consistency, as identified in chapter 3, taken together. The use of content analysis to score a company's environmental disclosure is appropriate for the following reasons. Firstly, it allows for a combination of the different aspects of each qualitative characteristic into one figure that is comparable across companies. Secondly, computation of a score for each CER qualitative characteristic covering a large sample can be achieved from the process of coding company annual and stand-alone environmental reports. Thirdly, not only can each CER qualitative characteristic be separately determined, but also the scoring system allows for the computation of an overall environmental disclosure quality that incorporates a balanced equal weighting for the four main qualitative characteristics, which, as explained in chapter 3, is one of the CER constraints taken from the studied financial reporting frameworks. Although this scoring process could be argued as being inherently subjective, it does ensure that irrelevant or redundant information strategically provided in company annual and environmental reports is not considered (Cormier et al., 2005).

In sections 4.2 to 4.5 the measurements for each of the four identified qualitative characteristics are considered in turn, by investigating how these aspects have been addressed in the financial reporting literature, the relevance of which having been explained in chapter 3. Once the optimal measurement methods have been decided upon, at the end of each section there is a summary of the scoring system used. The way

of combining these measures of the qualitative characteristics into an overall (or total) CER quality measure is the subject of section 4.6.

The details of the independent variables employed in the analyses are discussed in section 4.7 and the chapter concludes with a description of the analytical methods, including specification of the regression models (section 4.8). These are structured around three studies: an examination of the determinants of variation in the CER quality, tests of mimetic/coercive behaviours as per institutional theory and a study of the interrelationship between environmental and financial performance.

Notational Note

The measure of a CER qualitative characteristic, *CERQ*, for firm *j* in respect of its report for the period *t* is designated $CERQ_{jt}$, where *CERQ* is specified as:

U = understandability
RELE = relevance
RELI = reliability
C = comparability and consistency

The score for each characteristic is a combination of individually-scored components each designated the suffix *i* and what they comprise is subsequently explained under the characteristic headings set out above. Thus, for example, the understandability score for firm *j* and its report for the period *t*, U_{jt}, is a combination of scores for the component measures, U_{ijt}. Subsequently, the total CER quality measure, attained by combining the scores for the four characteristics for firm *j* and its report for the period *t*, is designated as Q_{jt}.

4.1 Sample Selection

4.1.1 Sample Firms

The sample for the study comprises reports for the year ends 2005 and 2006 of firms domiciled and listed as being, at the end of those years, in the UK or US.[10] Using only listed companies, rather than unlisted ones, provides some assurance of a relatively wide shareholder and potential investor base, thus controlling for the effects of a dominating shareholder or small group of shareholders that might exert unobservable influences on reporting behaviour. These two countries were selected as they represent highly developed but distinct financial accounting and reporting regimes (principles- vs. rules-based), but otherwise are comparable in terms of having active and transparent equity markets. Moreover, using a longitudinal sample increases confidence in the cross sectional findings as well as being necessary, given that, as explained in chapter 3, the adaptive behaviours described in institutional theory are to be tested. The selected accounting periods were the most recent for which the relevant reports were available at the commencement of the study and were also significant in the context of the UK as they preceded implementation of the Act (Great Britain. *Companies Act 2006*), which requires reporting on environmental matters as part of the Business Review of listed companies. Thus, the UK companies in the sample were still operating under a fully voluntary disclosure regime for CER.[11] Moreover, the selection of two consecutive years was considered beneficial as it controlled for extreme/one-off events that might occur during a longer period, whilst still allowing sufficient time for firms to respond to others' reporting practices.

The chosen sample firms were those that were the largest by capitalisation in each country (i.e. constituents of the FTSE100 or S&P100 respectively) that had been requested to complete CDP questionnaires for the relevant period, i.e. CDP4 and CDP5. The latter requirement was imposed, because data on greenhouse gas (GHG) emissions from the CDP database could be used as a proxy measure of environmental performance, as discussed further in section 4.7 below.

As covered in more detail in the next chapter, a subset of the sample thus obtained has had to be employed in certain parts of the analysis, because many of the firms within the

[10] Thus, in a small minority of cases the relevant report was not for the calendar year. For example, a report in respect of the year having ended 30 September 2005 was categorised as one for 2005.

[11] Whether the briefly-stated requirements of the Act have actually changed reporting practice is beyond the scope of this study, although its impact is an interesting avenue for future research. The main point here is that the effects of any such change are excluded in this research.

scope of the CDP did not provide usable data. Although the sample was nevertheless adequate, consideration was given to extending the time period to earlier years. However, prior to the focal years the scope of the CDP was more restricted (to the FT500 rather than including both the FTSE350 and S&P500, as was subsequently the case) and it was also found that even fewer firms responded for these years. In fact, for CDP3 (2004 data) and CDP2 (2003 data) only 26 UK and 62 US firms responded with full or incomplete GHG emissions data.

4.1.2 Relevant Reports

A large part of the previous literature investigating the determinants of CER deals with disclosures in companies' annual reports. With respect to this, it has been argued that these reports are the most important source of information on corporate activities and it is the only document that is automatically sent to shareholders by all companies as well as being available to all stakeholders who express an interest. However, nowadays companies are increasingly using a variety of alternative reporting media, including: press releases, stand-alone reports on environmental matters and Internet homepages. Holland and Boon Foo (2003) recognised the importance of other forms of corporate communication of social and environmental information and their empirical study even elicited that for many firms this takes the form of stand-alone reports. The growth in the salience of stand-alone reports has also been highlighted in Tilt (2008), when analysing the behaviour of Australian sample companies during the 1990s. Ho and Taylor (2007) as well realised the limitation of only considering the annual report for determining the nature of a firm's social and environmental disclosure, thus they examined stand-alone reports and corporate websites in addition to the annual reports. To avoid the incompleteness of environmental reporting, therefore, in addition to the primary use of corporate annual reports, the environmental disclosures in other supplemental environmental reports of the sample companies are extensively included in this study.[12]

[12] These reports may be called variously: sustainability report; corporate responsibility report; social responsibility report; environment report; citizenship report; corporate philanthropy report; environmental, health and safety report; etc. For this thesis, these stand-alone reports, regardless of title, are treated as being equivalent.

In addition, consideration was given to including corporate web pages in the analysis, as this medium has become increasingly used to distribute corporate documents, such as annual reports and other stand-alone reports. However, for the two focal years it emerged that such data was undated, with the only dates available being those showing the last date of copyright and this limitation of no defined reporting period made the information unusable. Despite this drawback, the web disclosures of a great deal of the sample were reviewed using Internet Archive, a not for profit site that acts as an internet library of websites.[13] It was found that if firms published environmental stand-alone reports these contained the majority of environmental information with little, if any, additional information exclusive to the website. Nevertheless, for firms that did not publish such reports, web disclosures, if available, have been included in the content analysis (for example, in the case of National Grid plc) in addition to their annual reports, so as to extend the completeness of the reporting as much as possible.

Within the relevant reports, the analysis was confined to information identified by applying the following rules:

- Only environmental information in both annual reports and stand-alone reports was selected. Social information e.g. community investment, commitment to employees, etc. and other information especially financial information in the annual reports was excluded.
- Information about corporate governance in the annual reports was included as some environmental responsibility information is often found there.
- Information about risk management and risk factors referring to environmental issues in the annual reports was included in the analysis.
- Information in the directors' remuneration report in the annual reports was not taken into account.

As noted above, primary data for the CER quality measures were obtained from reports for the years ending in 2005 and 2006. However, to obtain prior year comparatives for

[13] The web address for Internet Archive is http://www.archive.org/. However, the consistency of the issuing date of data was problematic. For instance, the archived results of www.kelda.co.uk of Kelda Group plc, which has a financial year end of 31st March, provided very few pages relevant to the years 2005 and 2006 and no pages precisely relating to the years ending 31st March 2005 and 2006. The archived results showed pages dated 30th January 2005, 10th February 2005 and 27th September 2006 (Internet Archive, 2001), and hence presented real difficulties in terms of accurate selection that met the time criterion.

the purposes of measuring the comparability and consistency qualitative characteristic, the relevant data had to be taken from the 2004 reports.

4.2 Understandability

4.2.1 Readability Formulae and Cloze Tests

In some prior research understandability has been taken as being synonymous with readability, with several authors having measured this concept in their studies of certain aspects of financial reports (Adelberg, 1979; Adelberg et al., 1980; Courtis, 1986; Jones, 1988; Lewis et al., 1986; Li, 2008; Schroeder and Gibson, 1990; Smith and Smith, 1971; Still, 1972). With the aim of establishing objective measures of complexity, with regards to the words and sentences in a passage, most of the formula-based studies of readability have used the Flesch index[14], either alone or in conjunction with other tests, such as the Fog[15] and Lix test[16] for estimating understandability (e.g. Courtis, 1986, 1995, 2004; Jones, 1988; Lewis et al., 1986; Li, 2008; Schroeder and Gibson, 1990; Smith and Smith, 1971; Still, 1972). However, Jones and Shoemaker (1994) noted that in non-accounting studies the Lix test has not been as widely used as the other two tests. The non-formulaic, subjective, cloze readability procedure[17] has

[14] The Flesch formula was developed as a readability measure with a comprehension score out of 100 and the lower the score, the more difficult it is to understand the passage. The factors that lead to low scores are high numbers of syllables per word and long sentences (Flesch, 1948). This formula is presented in subsection 4.2.7. This index was developed, using the 1925 McCall-Crabbs Standard Test Lessons in Reading as a criterion of difficulty (Flesch, 1948).

[15] The Fog and Flesch indices are similar as they are both based upon the McCall-Crabbs Standard Test Lessons in Reading (Jones and Shoemaker, 1994). However, unlike the Flesch score, the Gunning's (1968) Fog test presents US readers' grade levels rather than absolute scores and its formula is: Fog index = 0.4 * (WDS/SEN + %HW), where WDS/SEN is the average number of words per sentence and %HW is the percentage of hard words in the passage. Hard words comprise abbreviations, words with three or more syllables in a sentence, but proper nouns, compound words or common suffixes are excluded from the syllable count (Gunning, 1968).

[16] The Lix formula was developed to assess readability across languages, where the higher the score the more difficult the text is to understand. Its variables comprise word length and sentence length, with the former referring to the percentage of words of more than six letters and the latter the average number of words per sentence (Lix, 1968, cited in Lewis et al., 1986, p.201; cited in Jones and Shoemaker, 1994, p.176).

[17] Cloze, which derives its name from the concept of closure in Gestalt psychology, is a method for measuring the effectiveness of communication that asking readers complete a passage by filling in the

been used to measure differential understandability across financial report messages and financial report users of US companies' financial reports (Adelberg, 1979; Adelberg et al., 1980), but only rarely.

Previous research into understandability/readability has focused on a variety of countries, but American based studies have predominated. In relation to this, Adelberg (1979), Adelberg et al. (1980), Li (2008), Schroeder and Gibson (1990) and Smith and Smith (1971) studied messages contained in US company financial reports and/or corporate annual reports. Courtis (1986) used Canadian annual reports as their subject matter and Lewis et al. (1986) studied Australian financial reports, whilst Jones (1988) and Still (1972) investigated UK companies' annual reports. Further, Courtis (1995) compared the readability of annual reports of US, UK, Canadian, New Zealand and Hong Kong companies and Courtis (2004) measured the message contained in Hong Kong annual and interim reports. With the exception of the Jones (1988), Lewis et al. (1986) and Li's (2008) study, none of the above would appear to have investigated a particular company over a period longer than two years. In general, these scholars concluded that corporate reporting is couched in a specific professional style, which an unsophisticated reader often finds difficult to read and hence, is unable to understand the context of the information. This outcome raises the need for firms to pay more attention to the problems of effective communication in their corporate reports. Moreover, the annual reports of firms with poor financial performance are harder to read (Li, 2008), which suggests that "managers may be opportunistically structuring the annual reports to hide adverse information from investors" (Li, 2008, p.245).

4.2.2 Limitations of Readability Formulae

Whilst the formula-based approach allows for an objective assessment of the readability of financial report messages, it could be questioned as to whether the available formulae can truly reflect the level of difficulty (Courtis, 1998; Jones and Shoemaker, 1994). For

missing words in unfinished sentences. It was first introduced by Taylor (1953), who defined it as "a method of intercepting a message from a transmitter (writer or speaker), mutilating its language patterns by deleting parts, and so administering it to receivers (readers or listeners) that their attempts to make patterns whole again potentially yield a considerable number of cloze units" (Taylor, 1953, cited in Adelberg, 1979, p.568-569).

example, those based upon word complexity and sentence length may involve oversimplification, as they disregard several factors to do with the complexity of a sentence, such as: the unusual positioning of its components or clauses (Dreyer, 1984). Moreover, these variables may be unreliable when the length of a passage is short, but there is a complex sentence structure (Lewis et al., 1986) and consequently, the ease of readability score is not as low as it should be. In other words, fewer words or shorter sentence length does not necessarily always indicate a higher level of understandability of the messages. Conversely, longer sentences with simple words can be easily understood and yet, under this treatment the score would not accurately reflect the level of difficulty in comprehending the passage.

From a different perspective, Dreyer (1984) argued that readability formulae do not measure the appropriateness of the organisation of the text or whether the intended messages are organised coherently and logically and consequently the scores may be similar for both poorly structured and well-organised passages. Moreover, when such formulae have been used, elements of format or graphic design which may affect readability, such as: colour, illustrations, style and size of typeface, length of type line, punctuation, hyphenated words, length of paragraphs, etc., have been overlooked (Dreyer, 1984). Moreover, as well as these omissions, these formulae are unable to take account of the reader's level of interest and ability. Regarding this, as discussed further below, the extent of a reader's interest and familiarity with a topic can affect their level of understanding of the texts or messages (Jones and Shoemaker, 1994). Given these limitations, it is obvious that word and sentence difficulty as measured by the formulae should not be taken as being the only variables that influence understandability.

4.2.3 Assessing Readability and Understandability Using Cloze Tests

Although the terms readability and understandability have often been used interchangeably, some researchers (e.g. Jones and Shoemaker, 1994; Smith and Taffler, 1992) have argued that they do differ on the basis that there is no consensus about how closely the readability formulae reflect actual comprehension. In this regard, these academics hold that understandability relates to the reader and is determined by their: background, previous knowledge, topic familiarity, purpose of reading, interest,

motivation and reading proficiency. Readability, on the other hand, as assessed by the formulae, is text-related and hence, does not take these factors into account (Jones and Shoemaker, 1994), thus resulting in these formulae only assessing a part of text understandability.

Smith and Taffler (1992) pointed out that using the cloze procedure can address the issue of readers' competency that the above content formulae are unable to. With regards to this, they applied Flesch and Lix's readability formulae to the chairman narratives from a selection of manufacturing companies' reports and found that the scores produced reflected the difficulty of the passages in terms of textual complexity. Moreover, when they applied cloze exercises, they were able to ascertain that professional readers of company reports (such as accounting practitioners) score higher than students, which could not be elicited from the content formula approach. Hence, they concluded that formula-based tests measure readability, whilst the cloze procedure measures understandability, as it includes the need to recognise the capability of the target audience. Utilising the cloze procedure to investigate how the clarity and understandability of narrative disclosures in financial reports could be improved, Adelberg et al. (1980) came to the conclusion that firms could: use personal pronouns and active verbs, shorten sentences and simplify their information structure, define technical terms, use more colourful language to emphasise main points and repeat important points for clarification, to achieve this.

However, although these findings provide useful insights into understandability issues, the use of cloze to determine it is problematic, because the choosing of the sample is highly subjective and hence, any outcomes are closely related to the abilities of the reader rather than the level of the text itself (Lewis et al., 1986). A further potential weakness of this method of measuring understandability relates to the scoring, given that there are two possible ways to do so, either by giving a mark for only the exact words from the passages or doing so for equivalent words. If the latter approach is adopted, this introduces a further subjective judgment in relation to which words are equivalent and which are not.

4.2.4 Employing the Formula-Based Approach

To recap briefly the above discussion, the empirical studies in the area of financial reporting show that neither the readability formula-based techniques nor the so-called methods measuring understandability, such as the cloze tests, are free from limitation. The former have the advantage that they are quantitative and predictive measures of the level of difficulty of the text, thereby indicating the required ability of the reader, if he/she is to be able to comprehend the intended message (Courtis, 2004). However, at best these are general estimates of reading difficulty (Courtis, 2004) that only represent a part of understandability, because they fail to assess the level of comprehension of those who need to read the written information. Regarding the cloze procedure, which is claimed as a more appropriate method, this has the failing that the decision to use exact words or equivalent ones and which of the latter should be included, is highly subjective. Furthermore, the cloze test depends largely on the reading subjects and thus the score is influenced by their personal attributes (Lewis et al., 1986). Therefore, in this research so as to avoid the subjective elements in cloze procedure, but still noting the limitations of formula based approaches, the decision was made to engage with the latter for the empirical analysis on understandability. Moreover, this treatment has the advantage of being relatively easy to compute accurately and requires much less time and effort than cloze.

4.2.5 Selection of the Flesch Test

As mentioned above, the Lix test was developed to assess readability across languages, so the appropriateness of it for single-country or single-language studies is questionable. The Fog and Flesch indices are similar in that they are based on words and sentences as the factors for analysis and they both appear to be good indicators of reading difficulty. However, the former has flaws, because, as explained earlier, it considers the percentage of hard words in the passage as one of the main factors affecting readability and the definition for these is quite ambiguous. That is, the devisors of the Fog test identify: abbreviations and words having three or more syllables as hard, but exclude such entities as: proper nouns, compound words or common suffixes and hence, the choice of what is considered as a hard word and what is not relies heavily on the user's

subjectivity. As a result, this researcher is of opinion that the Flesch formula is more suitable an instrument for measuring the understandability of CER, because although it can be criticised for being rather simplistic, as explained earlier, it does at least provide consistency across different texts regarding their reading difficulty. Moreover, consistent with Jones and Shoemaker (1994), this approach is applied under the condition that the content analysis investigating the syntactic aspects of CER to assess the cognitive difficulty of reading textual environmental messages is assessed irrespective of the theme being reported.

The reading ease ratings, as devised by Flesch (1948), are shown in table 4.1 and are used here as part of the assessment regarding whether corporate environmental disclosures are understandable to their recipients. As can be seen, if the score lies above 50, it can be assumed that the CER messages are written in a manner which makes them comprehensible to the majority of readers (Courtis, 2004).

Table 4.1: Reading Ease Ratings as Suggested by Flesch (1948)

Reading Ease Ratings	Description of Style	Typical Style of Magazine
0-30	Very Difficult	Scientific
30-50	Difficult	Academic
50-60	Fairly Difficult	Quality
60-70	Standard	Digests
70-80	Fairly Easy	Slick-fiction
80-90	Easy	Pulp-fiction
90-100	Very Easy	Comics

However, Jones and Shoemaker (1994) noted that the readability formulae, including that of Flesch, were designed for non-technical children's material and have not been revalidated for reading material for adults. Consequently, since financial and accounting information are adult oriented and specialist in nature, the question arises as whether applying this approach can effectively assess the readability of such information and similar doubts are raised in relation to CER documents. However, given the intention not to use the research findings to draw conclusions on the levels of a reader's education nor to provide insights into linguistics, the general findings from applying the Flesch formula are able to provide useful results on the levels of readability of CER texts.

4.2.6 Non-Text Information Presentation Formats

If in this research the Flesch readability score were the only predictive measure of understandability used, this would ignore other elements of written communications that, as pointed out above, can contribute to understandability: e.g. appropriateness of text organisation, format or graphic design. However, there is a lack of literature in the area of accounting concerning these factors as a means of facilitating reading comprehension. Nevertheless, a number of research studies in psychology, education and management information systems have provided empirical evidence that information presented in a combination of text and non-text styles (graphs, graphics, pictures, colours, diagrams and tables) is more likely to be comprehended by the recipients.

Several studies (e.g. Butcher, 2006; Keller et al., 2006; Larkin and Simon, 1987; Mayer and Anderson, 1992; Mayer and Gallini, 1990; Robinson et al., 1998; Shah et al., 1999) have ascertained that graphical representations, such as: diagrams, graphs, charts and maps, support perceptual inferences and knowledge acquisition, which are difficult to engender from a text only, thereby increasing overall comprehension levels of the issues at hand. Other scholars have concluded that tabular and graphical displays (e.g. Benbasat and Dexter, 1986; Jarvenpaa and Dickson, 1988; Speier, 2006) lead to better and faster decision making. Moreover, it has emerged that information visualisation, with the aid of colour, helps readers to comprehend (Keller et al., 2006) and results in more effective decision making than when just text is employed (Benbasat and Dexter, 1986). Furthermore, in their review of experimental studies comparing text plus pictures with text alone, Levie and Lentz (1982), Fillippatou and Pumfrey (1996) and Carney and Levin (2002) all concluded that pictures can enhance reader comprehension and this is consistently better when the pictures relate to explicit information in the text. Further to using simple pictures and other graphical displays to facilitate comprehension, the employment of colour has been shown to enhance their effectiveness. In particular regarding this, in Readance and Moore's (1981) meta-analytic review of educational research on the effect of attached pictures on reading comprehension it emerged that colour photographs appear to have a greater effect than black and white ones.

In sum, the above studies have shown that readers are more likely to understand the meaning of information when they are exposed to visual representations (such as graphs, diagrams, charts, tables, pictures and colour where appropriate) than when they receive information simply as text. Here, it is assumed that this evidence that such visual aids help readers to understand information should also hold true for CER and therefore, the Flesch formula is complemented with measures of non-text styles of information representation, as explained below.

4.2.7 Scoring System for Content Analysis – Understandability

The understandability score for firm *j* and its report for the period *t*, U_{jt}, is the sum of the scores on the component understandability measures, U_{ijt}, for that report, i.e.

$$U_{jt} = \sum_i U_{ijt}$$

where the component measures are summarised in table 4.2.

For the reasons given above, the main component (i = 1) is the Flesch (1948) readability score, defined as:

$$U_1 = 206.835 - \left[\left(SL \times 1.015\right) + \left(WL \times 0.846\right)\right]$$

…… (1)

where *SL* = average sentence length (total number of words divided by the total number of sentences) and *WL* = average number of syllables per hundred words of text, i.e. 100 × (total number of syllables in the text/total number of words in the text). The score is obtained by processing the relevant text in Microsoft Word, which computes and displays the score as the "Flesch Reading Ease" score, using the above standard formula.[18]

The other components (i = 2 to 6.2) reflect the use of non-textual communication devices to assist understandability, scored as shown in table 4.2. For these purposes, the following definitions were taken from Vekiri (2002):

[18] Microsoft Word displays the reading level of the document as part of the standard spelling and grammar check routine provided the "reading ease" toggle is activated in the options for this procedure (Microsoft Corporation, 2008).

- **Graph** refers to a pictorial representation of quantitative data made in a non-numeric illustration that enables viewers to compare and observe relations among variables, for example: a line graph (shows relations by the shape of the line), a bar graph (shows relations by the relative size of the bars) and a pie chart (e.g. shows relations by the size of portion in a sector at the: local, regional, or global levels).
- **Picture resembling a graph** refers to a picture showing information for the current reporting period (e.g. one year), but excludes past and future data as well as any relations between the reported matter.
- **Diagram** means a picture or model illustration showing: processes, structure and operation of real objects or abstract entities and relations among concepts and/or sequence of events, for example: a policy flow diagram, a tree diagram illustrating the level of management responsible for environmental policies or a chart presenting the application of environmental policies in sequential order.
- **Table** refers to information displayed in a matrix format, which is labelled or identified as a table within the text and can refer to the presentation of numeric information for a certain period of time or between points in time or a table organising/summarising the text information. However, this does not include content tables referring to the subject matter on different pages in the company report.

Table 4.2: System of Scoring – Understandability

U_i	Understandability Indicators	Score
U_1	**Readability score**	**100**
	Flesch Reading Ease (calculated from Microsoft Word's Readability Statistics)	0-100
	The report provides the following non-text items to: facilitate comprehension of complex information, add additional meaning to the text discussion, highlight results and/or to represent both qualitative and quantitative data:	
U_2	**Graph(s)**	**2**
	Presenting graph(s)	2
	Presenting picture(s) resembling graph(s)	1
	Presenting text only	0
U_3	**Diagram(s)**	**1**
	Presenting diagram(s)	1
	Presenting text only	0
U_4	**Table(s)**	**1**
	Presenting consolidated data in table(s)	1
	Presenting text only	0
U_5	**Picture(s)**	**2**
	Presenting picture(s) and/or photograph(s), which support directly their environmental activity	2
	Presenting picture(s) and/or photograph(s), which is/are not referred to in the text, but express(es) the general orientation of the firm in relation to their environmental responsibility	1
	Presenting text only or presenting picture(s) and/or photograph(s), which is/are not at all related to company environmental responsibility	0
U_6	**Colour(s)**	
$U_{6.1}$	**Using colour(s) to emphasise in the text:**	**2**
	Using colour(s) to emphasise in the text, both for headings and details	2
	Using colour(s) to emphasise in the text, either only in title(s)/heading(s) or only in details	1
	Using black and white representation only in the text	0
$U_{6.2}$	**Using colour(s) to emphasise: graphs, diagrams, tables, or pictures:**	**1**
	Using colour(s) to emphasise: graphs, diagrams, tables, or pictures	1
	Using black and white representation only in graphs, diagrams, tables, or pictures	0
	MAXIMUM TOTAL SCORE	**109**

4.3 Relevance

4.3.1 Relevance to Investors

The issue of the usefulness and relevance of financial information was initially studied by Ball and Brown (1968) who focused on the relation between accounting income numbers disclosed by corporations and changes of share prices in the capital markets, because the latter, as claimed by these authors, is an effective proxy for shareholder response to this information. Subsequently, a number of empirical studies (e.g. Ali and Hwang, 2000; Bao and Chow, 1999; Bartov et al., 2005; Francis and Schipper, 1999; Hand, 2005; Vafeas et al., 1998) examined the relevance of accounting information reported in various national financial reports to equity valuation. More specifically, using regression analysis these studies have primarily defined relevance in terms of the explanatory power of accounting variables (such as earnings and book value of equity) for share returns in the capital market. In general, they elicited that unexpected changes (increase/decrease) in accounting information are associated with share price responses (positive/negative), implying that accounting information has predictive value regarding a company's future cash flows, thus demonstrating the relevance of this information to investors' decision-making.

These researchers used a variety models to structure their tests with a range of different proxies to measure the accounting information and value of equity. For example, Francis and Schipper (1999) used several measures of accounting data (earnings, assets, liabilities and the book value of equity data) and employed the cumulative market-adjusted returns of US companies over the 15 months ending 3 months after the fiscal year end as a measure of equity value. In Ali and Hwang's (2000) examination of the relevance of accounting data of companies from 16 countries (divided into the US and non-US), some other measures of accounting data and equity value were added, such as accruals and cash flows from operations for the former and market equity values at the beginning of the fiscal year for the latter. Almost similarly, Vafeas et al. (1998) undertook regression analysis on the effects of earnings, accruals and cash flows from operations information on the 12-month marketed-adjusted share returns of Cypriot companies. In addition, Bao and Chow (1999) investigated the impact of earnings per

share and book value per share on Chinese companies' share prices at the end of the fourth month following the fiscal year end. Furthermore, for a sample of US biotechnology firms, Hand (2005) carried out regressions of equity market values over the 3-month period after the fiscal year end on financial statement data, including: cash, non-cash assets, long-term debt, revenue, cost of sales and research and development expense. Additionally, Bartov et al. (2005) ran regressions for the 12-month share returns for the period ending six months after the fiscal year end on earnings information, to investigate the comparative relevance of consolidated financial statements reported under the German GAAP, US GAAP and International Accounting Standards (IAS). In sum, all these studies were focused on a 10-year period variation or greater, except for those of Bao and Chow (1999), Bartov et al. (2005) and Hand (2005), which estimated cross-sectional regressions for: 5-year, 3-year and 6-year periods, respectively.

4.3.2 Limitations

From the above, it has emerged that empirical studies dealing with the relevance of financial information to investors have invariably used share prices movement as a proxy for the latter. This narrow focus would appear to imply that they saw current and future investors as the primary users of financial statements, thereby ignoring the relevance of such information to other users. Additionally, because the prior research interest was on very specific earnings or other accounting information, the results of these studies fail to elicit the impact of all aspects of financial reporting on investors' decision making. Hence, the findings from the earlier empirical research have failed to capture the relevance aspect of the usefulness concept in financial information, as suggested by the FASB, ASB and IASB's conceptual frameworks, which call for the focus to be on the entire financial reporting package, including all items on the financial statements as well as the notes.

4.3.3 Principles of Relevance in CER

Taking the above into account and supported by stakeholder theory and prior studies regarding the value-relevance of CER information, as discussed in the literature review chapter, this researcher is of the opinion that when considering the relevance of the CER information other stakeholder views need to be taken into account, if robust outcomes are to be achieved. Moreover, it is desirable that the information processed covers as wide a range as possible on CER, which is also in contrast to the prior literature in relation to financial reporting. However, it would be difficult and time consuming to determine the relevance of each aspect of the information for all types of stakeholders. Further, because CER is largely presented under voluntary regimes, according to legitimacy theory, if a company has poor performance on some of the relevant issues then its management might decide to deflect attention from this by highlighting other accomplishments, which could be irrelevant to the readers' decision making. Therefore, in an analysis of CER information content only those aspects considered to be of relevance to decision makers (i.e. readers/users) is the most appropriate approach for assessing this characteristic in CER. These relevance aspects are those pertaining to this qualitative characteristic in the CER framework developed in the previous chapter, which comprise: the sustainability context in relation to its confirmatory and predictive values and the balance between positive and negative contributions. In particular in this regard, the environmental performance indicators contained in guidelines, such as: the GRI (GRI, 2006b) and DEFRA (DEFRA, 2006) and the requirements in s.417 of the Act for companies' environmental impacts as contained in their business review (Great Britain. *Companies Act 2006*), are employed to provide the underpinning principles of the relevance characteristic. Those aspects signifying the relevance of CER are summarised in table 4.3 and are subsequently employed as measures of this, as described below.

Table 4.3: Aspects Signifying CER Relevance Used in CER Content Analysis

	Aspects Signifying CER Relevance to be Used in the Analysis of CER Content	Corresponding Elements of Relevance Characteristic
1	CER considered represents significant topics associated with the sector (DEFRA, 2006, p.65-74; GRI, 2003, 2005a, 2005b, 2006a, 2007, 2008a, 2008b).	Sustainability context, balance between positive and negative aspects
2	It is preferable that the CER presents performance in quantifiable terms (GRI, 2006b, p.25, 28 and 29; DEFRA, 2006, p.16).	Confirmatory value
3	CER presents performance showing the extent of a company's eco-efficiency (GRI, 2006b, p.11 and 25).	Predictive value
4	CER contains information on the organisation's environmental policies, presents performance with reference to targets and shows the commitment to addressing high priority environmental aspects associated with the sector (GRI, 2006b, p.9 and 27).	Predictive value
5	CER presents performance regarding its impact and contribution (GRI, 2006b, p.12).	Predictive value, confirmatory value
6	CER includes information about the company's compliance or non-compliance with related environmental laws and regulations incidents (GRI, 2006b, p.29).	Predictive value, confirmatory value
7	CER reports long-term strategy, risks and opportunities. Risks are considered in two ways:	
a	those that are internalised into the financial statement, such as fines and expenditures (GRI, 2006b, p.29), which are covered in item 6 and	Confirmatory value
b	future risks, e.g. quantified contingencies/obligations from the firm's impact on the environment and vice versa, through, in particular, climate change (Great Britain. *Companies Act 2006*, s.417). These aspects are of concern owing to the fact that society is becoming increasingly aware of the damage that business activities can cause to the environment and the consequent harm to people's quality of life. This is leading to a decline in public confidence in conventional risk assessment coupled with increasing calls to be involved in the decision making in relation to environmental risks. With regards to this, the International Finance Corporation (IFC), a member of the World Bank Group, has suggested that financial institutions should act to review such risks and the impacts of client companies on the environment, through their Policy on Social and Environmental Sustainability (IFC, 2006, p.3). Therefore, it is assumed that the disclosure of environmental risks should form a crucial part of the relevance measure. Further, there is growing demand for company risk disclosure to contain potential environmental impacts on their future business performance (e.g. the risks from natural disasters, hurricane, floods, etc.), thereby implying that they more and more being seen as financial risks to the company (e.g. Green, 2006, p.28-29; Roner, 2007). However, there is no formal mandatory regulation which demands corporate disclosure of such risk as in the case of other financial liabilities. Nevertheless, as this aspect of environmental risks implies predictive value, it is deemed worth considering here as a relevance factor of CER.	Predictive value

The Significant Topics Associated with Each Industrial Sector

Referring to the first relevance aspect in table 4.3, that is, the significant topics associated with each industrial sector, pilot versions of GRI Supplements, which provide sector-specific social and environmental core indicators, in no particular order of importance, are employed here with ordinally ranked DEFRA (2006) indicators (first being most important), despite the incompleteness of the former and the possibility of their incompatibility with the later G3 (GRI, 2006b) version. Regarding this matter, only those for the: telecommunications (GRI, 2003), financial services (GRI, 2005a), mining and metals (GRI, 2005b), logistics and transportation (GRI, 2006a), electric utility (GRI, 2007), construction and real estate (GRI, 2008a) and food processing (GRI, 2008b) sectors, had been developed at the commencement of this study, all for use with the GRI 2002 Sustainability Reporting Guidelines (GRI, 2002) rather than the G3 ones. A list of the significant topics for each of the industry sectors is summarised in table 4.4 and the sector classification is based on the two-digit International Standard Industrial Classification of All Economic Activities Revision 3.1 (ISIC Rev.3.1) (United Nations, 2002), following DEFRA (2006, p.65-74). Further, in table 4.4 each of the significant topics identified in the DEFRA (2006) and GRI Supplement guidelines and that are subsequently elaborated upon in terms of their content, is allocated an indicator variable *RELE* with a suffix that corresponds to the overall amalgamated set of items to be scored, as set out in table 4.5. For example, the GHG emissions issue is defined as $RELE_5$ which refers to a combination of the scores on the component measures regarding this particular topic for firm *j* and its report for the period *t*, $RELE_{ijt}$, where the first or first and second digit represent(s) *i* between 5.1.1 to 5.3.6 on this aspect.

Table 4.4: A List of the Significant Topics for Each of the Industry Sectors

Two-Digit ISIC Rev.3.1	Significant issues based on DEFRA (2006, p.65-74)	Significant issues based on core indicators of the GRI Supplements		
		Only in the GRI Supplements	Both in the GRI Supplements and the DEFRA	GRI Supplements
10 Mining of coal and lignite; extraction of peat	coal: in materials/resource ($RELE_1$), GHGs emissions ($RELE_5$), water ($RELE_3$), metal emissions to land ($RELE_{8.3}$), acid rain and smog precursor emissions ($RELE_7$), waste ($RELE_{10.1}$)	Energy ($RELE_2$), biodiversity ($RELE_4$), ODS emissions ($RELE_6$), major discharges to water ($RELE_{9.1}$), significant spills ($RELE_{11}$), products and services ($RELE_{13}$), compliance ($RELE_{14}$)	coal: in materials/resource ($RELE_1$), water ($RELE_3$), GHGs emissions ($RELE_5$), acid rain and smog precursor emissions ($RELE_7$), waste ($RELE_{10.1}$)	GRI (2005b)
11 Extraction of crude petroleum and natural gas; service activities incidental to oil and gas extraction, excluding surveying	GHGs emissions ($RELE_5$), water ($RELE_3$), acid rain and smog precursor emissions ($RELE_7$), oil and natural gas: in materials/resource ($RELE_1$), waste ($RELE_{10.1}$)			
13 Mining of metal ores	metals: in materials/resource ($RELE_1$), water ($RELE_3$), metal emissions to air ($RELE_{8.1}$), GHGs emissions ($RELE_5$), metal emissions to water ($RELE_{9.2}$), acid rain and smog precursor emissions ($RELE_7$), metal emissions to land ($RELE_{8.3}$), waste ($RELE_{10.1}$), pesticide and fertiliser emissions ($RELE_{8.4}$)	Energy ($RELE_2$), biodiversity ($RELE_4$), ODS emissions ($RELE_6$), major discharges to water ($RELE_{9.1}$), significant spills ($RELE_{11}$), products and services ($RELE_{13}$), compliance ($RELE_{14}$)	metals: in materials/resource ($RELE_1$), water ($RELE_3$), GHGs emissions ($RELE_5$), acid rain and smog precursor emissions ($RELE_7$), waste ($RELE_{10.1}$)	GRI (2005b)
15 Manufacture of food products and beverages	water ($RELE_3$), GHGs emissions ($RELE_5$), waste ($RELE_{10.1}$), acid rain and smog precursor emissions ($RELE_7$),	materials/resource ($RELE_1$), energy ($RELE_2$), biodiversity ($RELE_4$), ODS emissions ($RELE_6$), significant spills	water ($RELE_3$), GHGs emissions ($RELE_5$), acid rain and smog precursor emissions ($RELE_7$),	GRI (2008b)

Table 4.4: A List of the Significant Topics for Each of the Industry Sectors (continued)

Two-Digit ISIC Rev.3.1	Significant issues based on DEFRA (2006, p.65-74)	Significant issues based on core indicators of the GRI Supplements		
		Only in the GRI Supplements	Both in the GRI Supplements and the DEFRA	GRI Supplements
	nutrients and organic pollutants: in major discharges to water ($RELE_{9.1}$)	($RELE_{11}$), products and services ($RELE_{13}$), compliance ($RELE_{14}$), transportation ($RELE_{15}$)	nutrients and organic pollutants: in major discharges to water ($RELE_{9.1}$), waste ($RELE_{10.1}$)	
16 Manufacture of tobacco products	water ($RELE_{3}$), waste ($RELE_{10.1}$), GHGs emissions ($RELE_{5}$)			
21 Manufacture of paper and paper products	water ($RELE_{3}$), GHGs emissions ($RELE_{5}$), waste ($RELE_{10.1}$), VOC emissions ($RELE_{8.2}$), acid rain and smog precursor emissions ($RELE_{7}$), metal emissions to land ($RELE_{8.3}$), metal emissions to water ($RELE_{9.2}$), nutrients and organic pollutants: in major discharges to water ($RELE_{9.1}$)			
22 Publishing, printing and reproduction of recorded media	GHGs emissions ($RELE_{5}$), waste ($RELE_{10.1}$), water ($RELE_{3}$), metal emissions to land ($RELE_{8.3}$), acid rain and smog precursor emissions ($RELE_{7}$), VOC emissions ($RELE_{8.2}$)			
23 Manufacture of coke, refined petroleum products and nuclear fuel	GHGs emissions ($RELE_{5}$), water ($RELE_{3}$), metal emissions to land ($RELE_{8.3}$), acid rain and smog precursor			

Table 4.4: A List of the Significant Topics for Each of the Industry Sectors (continued)

Two-Digit ISIC Rev.3.1	Significant issues based on DEFRA (2006, p.65-74)	Significant issues based on core indicators of the GRI Supplements		
		Only in the GRI Supplements	Both in the GRI Supplements and the DEFRA	GRI Supplements
	emissions ($RELE_7$), waste ($RELE_{10.1}$), metal emissions to air ($RELE_{8.1}$), radioactive waste ($RELE_{10.2}$)			
24 Manufacture of chemicals and chemical products	water ($RELE_3$), GHGs emissions ($RELE_5$), metal emissions to land ($RELE_{8.3}$), waste ($RELE_{10.1}$), VOC emissions ($RELE_{8.2}$), metal emissions to air ($RELE_{8.1}$), ODS emissions ($RELE_6$), nutrients and organic pollutants: in major discharges to water ($RELE_{9.1}$), acid rain and smog precursor emissions ($RELE_7$)			
26 Manufacture of other non-metallic mineral products	GHGs emissions ($RELE_5$), acid rain and smog precursor emissions ($RELE_7$), waste ($RELE_{10.1}$), metal emissions to air ($RELE_{8.1}$), metal emissions to land ($RELE_{8.3}$), water ($RELE_3$)			
27 Manufacture of basic metals	water ($RELE_3$), metal emissions to land ($RELE_{8.3}$), GHGs emissions ($RELE_5$), waste ($RELE_{10.1}$), metal emissions to air ($RELE_{8.1}$), acid rain and smog precursor emissions ($RELE_7$)	materials/resource ($RELE_1$), energy ($RELE_2$), biodiversity ($RELE_4$), ODS emissions ($RELE_6$), major discharges to water ($RELE_{9.1}$), significant spills ($RELE_{11}$), products and services	water ($RELE_3$), GHGs emissions ($RELE_5$), acid rain and smog precursor emissions ($RELE_7$), waste ($RELE_{10.1}$)	GRI (2005b)

Table 4.4: A List of the Significant Topics for Each of the Industry Sectors (continued)

Two-Digit ISIC Rev.3.1	Significant issues based on DEFRA (2006, p.65-74)	Significant issues based on core indicators of the GRI Supplements		
		Only in the GRI Supplements	Both in the GRI Supplements and the DEFRA	GRI Supplements
		($RELE_{13}$), compliance ($RELE_{14}$)		
28 Manufacture of fabricated metal products, except for machinery and equipment	GHGs emissions ($RELE_5$), water ($RELE_3$), waste ($RELE_{10.1}$), acid rain and smog precursor emissions ($RELE_7$)	materials/resource ($RELE_1$), energy ($RELE_2$), biodiversity ($RELE_4$), ODS emissions ($RELE_6$), major discharges to water ($RELE_{9.1}$), significant spills ($RELE_{11}$), products and services ($RELE_{13}$), compliance ($RELE_{14}$)	water ($RELE_3$), GHGs emissions ($RELE_5$), acid rain and smog precursor emissions ($RELE_7$), waste ($RELE_{10.1}$)	GRI (2005b)
29 Manufacture of machinery and equipment n.e.c. 30 Manufacture of office, accounting and computing machinery	GHGs emissions ($RELE_5$), water ($RELE_3$), waste ($RELE_{10.1}$), metal emissions to land ($RELE_{8.3}$)			
32 Manufacture of radio, television and communication equipment and apparatus	GHGs emissions ($RELE_5$), water ($RELE_3$), metal emissions to land ($RELE_{8.3}$), waste ($RELE_{10.1}$)			
33 Manufacture of medical, precision and optical instruments, watches and clocks	GHGs emissions ($RELE_5$), acid rain and smog precursor emissions ($RELE_7$), water ($RELE_3$), waste ($RELE_{10.1}$)			
35 Manufacture of other	GHGs emissions ($RELE_5$), water			

Table 4.4: A List of the Significant Topics for Each of the Industry Sectors (continued)

Two-Digit ISIC Rev.3.1	Significant issues based on DEFRA (2006, p.65-74)	Significant issues based on core indicators of the GRI Supplements		
		Only in the GRI Supplements	Both in the GRI Supplements and the DEFRA	GRI Supplements
transport equipment	($RELE_3$), waste ($RELE_{10.1}$)			
40 Electricity, gas, steam and hot water supply	GHGs emissions ($RELE_5$), waste ($RELE_{10.1}$), acid rain and smog precursor emissions ($RELE_7$), radioactive waste ($RELE_{10.2}$), water ($RELE_3$), metal emissions to land ($RELE_{8.3}$), metal emissions to air ($RELE_{8.1}$), metal emissions to water ($RELE_{9.2}$)	materials/resource ($RELE_1$), energy ($RELE_2$), biodiversity ($RELE_4$), ODS emissions ($RELE_6$), major discharges to water ($RELE_{9.1}$), significant spills ($RELE_{11}$), products and services ($RELE_{13}$), compliance ($RELE_{14}$)	water ($RELE_3$), GHGs emissions ($RELE_5$), acid rain and smog precursor emissions ($RELE_7$), waste ($RELE_{10.1}$)	GRI (2007)
41 Collection, purification and distribution of water	water ($RELE_3$), GHGs emissions ($RELE_5$), acid rain and smog precursor emissions ($RELE_7$), nutrients and organic pollutants: in major discharges to water ($RELE_{9.1}$)			
45 Construction	GHGs emissions ($RELE_5$), water ($RELE_3$), acid rain and smog precursor emissions ($RELE_7$), waste ($RELE_{10.1}$)	materials/resource ($RELE_1$), energy ($RELE_2$), compliance ($RELE_{14}$), transportation ($RELE_{15}$)	water ($RELE_3$), GHGs emissions ($RELE_5$), waste ($RELE_{10.1}$)	GRI (2008a)
51 Wholesale trade and commission trade, except for motor vehicles and motorcycles	GHGs emissions ($RELE_5$), waste ($RELE_{10.1}$)			

Table 4.4: A List of the Significant Topics for Each of the Industry Sectors (continued)

Two-Digit ISIC Rev.3.1	Significant issues based on DEFRA (2006, p.65-74)	Significant issues based on core indicators of the GRI Supplements		
		Only in the GRI Supplements	Both in the GRI Supplements and the DEFRA	GRI Supplements
52 Retail trade, except for motor vehicles and motorcycles; repair of personal and household goods 55 Hotels and restaurants 74 Other business activities				
61 Water transport 62 Air transport	GHGs emissions ($RELE_5$), acid rain and smog precursor emissions ($RELE_7$), waste ($RELE_{10.1}$)	materials/resource ($RELE_1$), energy ($RELE_2$), water ($RELE_3$), biodiversity ($RELE_4$), ODS emissions ($RELE_6$), major discharges to water ($RELE_{9.1}$), significant spills ($RELE_{11}$), products and services ($RELE_{13}$), compliance ($RELE_{14}$)	GHGs emissions ($RELE_5$), acid rain and smog precursor emissions ($RELE_7$), waste ($RELE_{10.1}$)	GRI (2006a)
64 Post and telecommunications	GHGs emissions ($RELE_5$), waste ($RELE_{10.1}$)	materials/resource ($RELE_1$), biodiversity ($RELE_4$)	GHGs emissions ($RELE_5$)	GRI (2003)
65 Financial intermediation, except for insurance and pension funding	GHGs emissions ($RELE_5$), waste ($RELE_{10.1}$)	materials/resource ($RELE_1$), energy ($RELE_2$), water ($RELE_3$), biodiversity ($RELE_4$), ODS emissions ($RELE_6$), acid rain and smog precursor emissions ($RELE_7$), major discharges to water ($RELE_{9.1}$), significant spills ($RELE_{11}$), products and services	GHGs emissions ($RELE_5$), waste ($RELE_{10.1}$)	GRI (2005a)

Table 4.4: A List of the Significant Topics for Each of the Industry Sectors (continued)

Two-Digit ISIC Rev.3.1	Significant issues based on DEFRA (2006, p.65-74)	Significant issues based on core indicators of the GRI Supplements		
		Only in the GRI Supplements	Both in the GRI Supplements and the DEFRA	GRI Supplements
		($RELE_{13}$), compliance ($RELE_{14}$)		
66 Insurance and pension funding, except for compulsory social security	GHGs emissions ($RELE_5$)	materials/resource ($RELE_1$), energy ($RELE_2$), water ($RELE_3$), biodiversity ($RELE_4$), ODS emissions ($RELE_6$), acid rain and smog precursor emissions ($RELE_7$), major discharges to water ($RELE_{9.1}$), waste ($RELE_{10.1}$), significant spills ($RELE_{11}$), products and services ($RELE_{13}$), compliance ($RELE_{14}$)	GHGs emissions ($RELE_5$)	GRI (2005a)
70 Real estate activities	GHGs emissions ($RELE_5$), waste ($RELE_{10.1}$)	materials/resource ($RELE_1$), energy ($RELE_2$), water ($RELE_3$), compliance ($RELE_{14}$), transportation ($RELE_{15}$)	GHGs emissions ($RELE_5$), waste ($RELE_{10.1}$)	GRI (2008a)
72 Computer and related activities	GHGs emissions ($RELE_5$), acid rain and smog precursor emissions ($RELE_7$)			
92 Recreational, cultural and sporting activities	GHGs emissions ($RELE_5$), acid rain and smog precursor emissions ($RELE_7$), waste ($RELE_{10.1}$)			

4.3.4 Scoring System for the Content Analysis – Relevance

The relevance score for firm *j* and its report for the period *t*, $RELE_{jt}$, is the sum of the scores for the component relevance measures, $RELE_{ijt}$, for that report, i.e.

$$RELE_{jt} = \sum_i RELE_{ijt}$$

Table 4.5 below illustrates the relevance scoring system for industry sector 10, mining of coal and lignite; extraction of peat, and those for the other sectors are given in appendix 2. As explained above, the industry specific reporting components are *i* = 1.1 to 15.3 and their contents covering items 2 – 7a in table 4.3 above, are presented. The set of final components (*i* = 16.1.1 to 16.2.3) reflect the confirmatory and predictive values inherent in the disclosed information, with regards to risks and liabilities, as specified in 7b of table 4.3. The scores in grey refer to relevance factors not appropriate to this particular industrial sector, but covered by others.

Table 4.5: System of Scoring – Relevance for Mining of Coal and Lignite; Extraction of Peat Sector

$RELE_i$	Relevance Indicators	Score
$RELE_1$	**MATERIALS/RESOURCE** *Report*ing *at least one of all major materials/resource used/extraction by the company:* For example: Natural gas: methane (CH_4), ethane (C_2H_6), propane (C_3H_8), butane (C_4H_{10}), pentane (C_5H_{12}) Oil Coal: lignite, hard coal Metals: iron, aluminium (bauxite), copper, lead, nickel, zinc, gold, silver	**11**
$RELE_{1.1}$	**Reporting on total or some of the materials/resource consumption/extraction:** In quantifiable terms (by weight: tonnes, kilograms or by volume: m^3, barrels of oil equivalent, litres) In qualitative terms (e.g. consider that it is a substantial part of business and/or associate this with environmental impact) No disclosure on any of the materials/resource consumption/extraction	**2** 2 1 0
$RELE_{1.2}$	**Presenting an analysis of total or some of the materials/resource consumption/extraction by sector and by process:** Analysis of both Analysis by business sectors/divisions/functions (e.g. extraction and production/mining, refining, sales, corporate) Analysis by business processes/activities (e.g. operations, productions/manufacturing, delivery products/transport/distribution) No analysis	**3** 3 2 1 0
$RELE_{1.3}$	**Presenting an analysis of total or some of the materials/resource consumption/extraction per unit of output/energy intensity/energy efficiency:** Analysis per unit of output e.g. consumption/extraction per kWh of energy produced, consumption/extraction per tonne of production No analysis	**1** 1 0
$RELE_{1.4}$	**Reporting on the impacts arising from their materials/resource consumption/extraction:** In quantitative monetary terms (e.g. £, $, etc.) In qualitative terms	**2** 2 1

Table 4.5: System of Scoring – Relevance for Mining of Coal and Lignite; Extraction of Peat Sector (continued)

$RELE_i$	Relevance Indicators	Score
	No disclosure on the impacts arising from their materials/resource consumption/extraction	0
$RELE_{1.5}$	**Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives for more efficient use/extraction of the materials/resource (including initiatives to recycle/reuse the materials/resource):**	**1**
	Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives for more efficient use/extraction of the materials/resource	1
	No reporting	0
$RELE_{1.6}$	**Specification of quantitative targets/timelines for the measures to mitigate the impacts and/or on any initiatives for more efficient use/extraction of the materials/resource:**	**2**
	Specification of short term quantitative targets/timelines (e.g. next year)	2
	Specification of long term quantitative targets/timelines (e.g. more than a year hence)	1
	No specification of quantitative targets/timelines	0
$RELE_2$	**ENERGY** *Reporting at least one of all energy used by the company:* Electricity Heat	**13**
$RELE_{2.1}$	**Reporting on total or some of direct energy use:**	**2**
	In quantifiable terms (kJ, GJ or kWh)	2
	In qualitative terms (e.g. consider that it is a substantial part of business and/or associate this with environmental impact)	1
	No disclosure on direct energy use	0
$RELE_{2.2}$	**Presenting an analysis of total or some of direct energy use by sector and by process:**	**3**
	Analysis of both	3
	Analysis by business sectors/divisions/functions (e.g. extraction and production/mining, refining, sales, corporate)	2

Table 4.5: System of Scoring – Relevance for Mining of Coal and Lignite; Extraction of Peat Sector (continued)

$RELE_i$	Relevance Indicators	Score
	Analysis by business processes/activities (e.g. operations, productions/manufacturing, delivery products/transport/distribution)	1
	No analysis	0
$RELE_{2.3}$	**Presenting an analysis of total or some of direct energy use per unit of output/energy intensity/energy efficiency:**	**1**
	Analysis per unit of output e.g. use per kWh of energy produced, use per tonne of production	1
	No analysis	0
$RELE_{2.4}$	**Reporting on total or some of indirect energy use:**	**2**
	(e.g. include energy bought from distributors for supplying to customers, energy use in transportation)	
	In quantifiable terms (kJ, GJ or kWh, MWh)	2
	In qualitative terms (e.g. consider that it is a substantial part of business and/or associate this with environmental impact)	1
	No disclosure on indirect energy use	0
$RELE_{2.5}$	**Reporting on the impacts arising from their energy use:**	**2**
	In quantitative monetary terms (e.g. £, $, etc.)	2
	In qualitative terms	1
	No disclosure on the impacts arising from their energy use	0
$RELE_{2.6}$	**Reporting on initiatives to use renewable energy sources and/or increase/improve energy efficiency:**	**1**
	Reporting on planned or implemented measures in production and supply of renewable energy (e.g. wind energy, solar power) and/or reporting on initiatives to increase/improve energy efficiency	1
	No reporting	0
$RELE_{2.7}$	**Specification of quantitative targets/timelines for the initiatives to use renewable energy sources and/or increase/improve energy efficiency:**	**2**
	Specification of short term quantitative targets/timelines (e.g. next year)	2
	Specification of long term quantitative targets/timelines (e.g. more than a year hence)	1

Table 4.5: System of Scoring – Relevance for Mining of Coal and Lignite; Extraction of Peat Sector (continued)

$RELE_i$	Relevance Indicators	Score
	No specification of quantitative targets/timelines	0
$RELE_3$	**WATER** *Report on total water use*	**11**
$RELE_{3.1}$	**Reporting on total water use:**	**2**
	In quantifiable terms (m^3, litres)	2
	In qualitative terms (e.g. consider that it is a substantial part of business and/or associate this with environmental impact)	1
	No disclosure on total water use	0
$RELE_{3.2}$	**Presenting an analysis of total water use by sector and by process:**	**3**
	Analysis of both	3
	Analysis by business sectors/divisions/functions (e.g. extraction and production/mining, refining, sales, corporate)	2
	Analysis by business processes/activities (e.g. operations, productions/manufacturing, delivery products/transport/distribution)	1
	No analysis	0
$RELE_{3.3}$	**Presenting an analysis of total water use per unit of output/energy intensity/energy efficiency:**	**1**
	Analysis per unit of output, e.g. use per kWh of energy produced, use per tonne of production	1
	No analysis	0
$RELE_{3.4}$	**Reporting on the impacts arising from their water use:**	**2**
	In quantitative monetary terms (e.g. £, $, etc.)	2
	In qualitative terms	1
	No disclosure on the impacts arising from their water use	0
$RELE_{3.5}$	**Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives for more efficient use of water (including initiatives to recycle/reuse water):**	**1**

Table 4.5: System of Scoring – Relevance for Mining of Coal and Lignite; Extraction of Peat Sector (continued)

$RELE_i$	Relevance Indicators	Score
	Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives for more efficient use of water (including initiatives to recycle/reuse water)	1
	No reporting	0
$RELE_{3.6}$	**Specification of quantitative targets/timelines for the measures to mitigate the impacts and/or of any initiatives for more efficient use of water:**	**2**
	Specification of short term quantitative targets/timelines (e.g. next year)	2
	Specification of long term quantitative targets/timelines (e.g. more than a year hence)	1
	No specification of quantitative targets/timelines	0
$RELE_4$	**BIODIVERSITY** *Location, size and major impacts of land owned, leased, managed in, or adjacent to protected areas and areas of high biodiversity value outside protected areas, which are associated with the organisation's activities, products and/or services:*	**7**
$RELE_{4.1}$	**Reporting on area/location and type of value (biodiversity rich, ecologically significant habitat areas, protected and sensitive areas) of land owned, leased, managed in, or adjacent to protected areas and areas of high biodiversity value outside protected areas:**	**2**
	Reporting on area/location and type of value (biodiversity rich, ecologically significant habitat areas, protected and sensitive areas) of land owned, leased, managed in, or adjacent to protected areas and areas of high biodiversity value outside protected areas	2
	Reporting on a concern regarding biodiversity rich, ecologically significant habitat areas, protected and sensitive areas in general with no specifying the areas that are environmentally destroyed by company activities, products and/or services	1
	Reporting nothing on biodiversity rich, ecologically significant habitat areas, protected and sensitive areas	0
$RELE_{4.2}$	**Reporting on known or likely environmental impacts of activities, products and/or services on biodiversity in the protected areas and areas of high biodiversity value outside protected areas:**	**2**
	In quantitative monetary terms (e.g. £, $, etc.)	2
	In qualitative terms	1
	No disclosure on the impacts arising from their activities, products and/or services on biodiversity in the protected areas and areas of high	0

Table 4.5: System of Scoring – Relevance for Mining of Coal and Lignite; Extraction of Peat Sector (continued)

$RELE_i$	Relevance Indicators	Score
	biodiversity value outside protected areas	
$RELE_{4.3}$	**Reporting on planned or implemented initiatives/policies/programmes to conserve, maintain or restore these areas to an acceptable standard:**	**1**
	Reporting on planned or implemented initiatives/policies/programmes to conserve, maintain or restore these areas to an acceptable standard	1
	No reporting	0
$RELE_{4.4}$	**Specification of quantitative targets/timelines for the planned or implemented initiatives/policies/programmes to conserve, maintain or restore these areas to an acceptable standard:**	**2**
	Specification of short term quantitative targets/timelines (e.g. next year)	2
	Specification of long term quantitative targets/timelines (e.g. more than a year hence)	1
	No specification of quantitative targets/timelines	0
$RELE_5$	**GREENHOUSE GASES (GHGs) EMISSIONS**	**33**
	Reporting at least one of all direct, indirect and total greenhouse gases (GHGs) emissions:	
	GHGs: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFC_s), perfluorocarbons (PFC_s), sulphur hexafluoride (SF_6)	
$RELE_{5.1}$	**Direct GHGs emissions:**	***11***
$RELE_{5.1.1}$	**Reporting on total or some of direct GHGs emissions:**	**2**
	In quantifiable terms (tonnes CO_2 equivalent)	2
	In qualitative terms (e.g. consider that it is a substantial part of business and/or associate this with environmental impact)	1
	No disclosure on direct GHGs emissions	0
$RELE_{5.1.2}$	**Presenting an analysis of total or some of direct GHGs emissions by sector and by process:**	**3**
	Analysis of both	3

Table 4.5: System of Scoring – Relevance for Mining of Coal and Lignite; Extraction of Peat Sector (continued)

$RELE_i$	Relevance Indicators	Score
	Analysis by business sectors/divisions/functions (e.g. extraction and production/mining, refining, sales, corporate)	2
	Analysis by business processes/activities (e.g. operations, productions/manufacturing, delivery products/transport/distribution)	1
	No analysis	0
$RELE_{5.1.3}$	**Presenting an analysis of total or some of direct GHGs emissions per unit of output/energy intensity/energy efficiency:**	**1**
	Analysis per unit of output e.g. consumption per kWh of energy produced, consumption per tonne of production	1
	No analysis	0
$RELE_{5.1.4}$	**Reporting on the impacts arising from their direct GHGs emissions:**	**2**
	In quantitative monetary terms (e.g. £, $, etc.)	2
	In qualitative terms	1
	No disclosure on the impacts arising from their direct GHGs emissions	0
$RELE_{5.1.5}$	**Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives to reduce the direct GHGs emissions (e.g. to reduce overall GHGs emissions, increase the energy efficiency, supply of renewable energy):**	**1**
	Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives to reduce the direct GHGs emissions (e.g. to reduce overall GHGs emissions, increase the energy efficiency, supply of renewable energy)	1
	No reporting	0
$RELE_{5.1.6}$	**Specification of quantitative targets/timelines for the measures to mitigate the impacts and/or of any initiatives to reduce the direct GHGs emissions (e.g. to reduce overall GHGs emissions, increase the energy efficiency, supply of renewable energy):**	**2**
	Specification of short term quantitative targets/timelines (e.g. next year)	2
	Specification of long term quantitative targets/timelines (e.g. more than a year hence)	1
	No specification of quantitative targets/timelines	0
$RELE_{5.2}$	**Indirect GHGs emissions:**	***11***

Table 4.5: System of Scoring – Relevance for Mining of Coal and Lignite; Extraction of Peat Sector (continued)

$RELE_i$	Relevance Indicators	Score
$RELE_{5.2.1}$	**Reporting on total or some of indirect GHGs emissions:**	**2**
	In quantifiable terms (tonnes CO_2 equivalent)	2
	In qualitative terms (e.g. consider that it is a substantial part of business and/or associate this with environmental impact)	1
	No disclosure on indirect GHGs emissions	0
$RELE_{5.2.2}$	**Presenting an analysis of total or some of indirect GHGs emissions by sector and by process:**	**3**
	Analysis of both	3
	Analysis by business sectors/divisions/functions (e.g. extraction and production/mining, refining, sales, corporate)	2
	Analysis by business processes/activities (e.g. operations, productions/manufacturing, delivery products/transport/distribution)	1
	No analysis	0
$RELE_{5.2.3}$	**Presenting an analysis of total or some of indirect GHGs emissions per unit of output/energy intensity/energy efficiency:**	**1**
	Analysis per unit of output e.g. consumption per kWh of energy produced, consumption per tonne of production	1
	No analysis	0
$RELE_{5.2.4}$	**Reporting on the impacts arising from their indirect GHGs emissions:**	**2**
	In quantitative monetary terms (e.g. £, $, etc.)	2
	In qualitative terms	1
	No disclosure on the impacts arising from their indirect GHGs emissions	0
$RELE_{5.2.5}$	**Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives to reduce the indirect GHGs emissions (e.g. to reduce overall GHGs emissions, increase the energy efficiency, supply of renewable energy):**	**1**
	Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives to reduce the indirect GHGs emissions (e.g. to reduce overall GHGs emissions, increase the energy efficiency, supply of renewable energy)	1
	No reporting	0
$RELE_{5.2.6}$	**Specification of quantitative targets/timelines for the measures to mitigate the impacts and/or of any initiatives to reduce the indirect**	**2**

Table 4.5: System of Scoring – Relevance for Mining of Coal and Lignite; Extraction of Peat Sector (continued)

$RELE_i$	Relevance Indicators	Score
	GHGs emissions (e.g. to reduce overall GHGs emissions, increase the energy efficiency, supply of renewable energy):	
	Specification of short term quantitative targets/timelines (e.g. next year)	2
	Specification of long term quantitative targets/timelines (e.g. more than a year hence)	1
	No specification of quantitative targets/timelines	0
$RELE_{5.3}$	**Combined/total GHGs emissions:**	***11***
$RELE_{5.3.1}$	**Reporting on combined/total GHGs emissions:**	**2**
	In quantifiable terms (tonnes CO_2 equivalent)	2
	In qualitative terms (e.g. consider that it is a substantial part of business and/or associate this with environmental impact)	1
	No disclosure on combined/total GHGs emissions	0
$RELE_{5.3.2}$	**Presenting an analysis of combined/total GHGs emissions by sector and by process:**	**3**
	Analysis of both	3
	Analysis by business sectors/divisions/functions (e.g. extraction and production/mining, refining, sales, corporate)	2
	Analysis by business processes/activities (e.g. operations, productions/manufacturing, delivery products/transport/distribution)	1
	No analysis	0
$RELE_{5.3.3}$	**Presenting an analysis of combined/total GHGs emissions per unit of output/energy intensity/energy efficiency:**	**1**
	Analysis per unit of output e.g. consumption per kWh of energy produced, consumption per tonne of production	1
	No analysis	0
$RELE_{5.3.4}$	**Reporting on the impacts arising from combined/total GHGs emissions:**	**2**
	In quantitative monetary terms (e.g. £, $, etc.)	2
	In qualitative terms	1
	No disclosure on the impacts arising from their combined/total GHGs emissions	0

Table 4.5: System of Scoring – Relevance for Mining of Coal and Lignite; Extraction of Peat Sector (continued)

$RELE_i$	Relevance Indicators	Score
$RELE_{5.3.5}$	**Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives to reduce the combined/total GHGs emissions (e.g. to reduce overall GHGs emissions, increase the energy efficiency, supply of renewable energy):**	**1**
	Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives to reduce the combined/total GHGs emissions (e.g. to reduce overall GHGs emissions, increase the energy efficiency, supply of renewable energy)	1
	No reporting	0
$RELE_{5.3.6}$	**Specification of quantitative targets/timelines for the measures to mitigate the impacts and/or of any initiatives to reduce the combined/total GHGs emissions (e.g. to reduce overall GHGs emissions, increase the energy efficiency, supply of renewable energy):**	**2**
	Specification of short term quantitative targets/timelines (e.g. next year)	2
	Specification of long term quantitative targets/timelines (e.g. more than a year hence)	1
	No specification of quantitative targets/timelines	0
$RELE_6$	**OZONE-DEPLETING SUBSTANCES (ODS) EMISSIONS**	**11**
	Reporting at least one of Ozone-Depleting Substances (ODS) emissions: ODS: chlorofluorocarbons (CFCs and Freons), hydrochlorofluorocarbons (HCFCs), halons, methyl chloroform, carbon tetrachloride, methyl bromide	
$RELE_{6.1}$	**Reporting on total or some of ODS emissions:**	**2**
	In quantifiable terms (tonnes CFC-11 equivalent)	2
	In qualitative terms (e.g. consider that it is a substantial part of business and/or associate this with environmental impact)	1
	No disclosure on ODS emissions	0
$RELE_{6.2}$	**Presenting an analysis of total or some of ODS emissions by sector and by process:**	**3**
	Analysis of both	3
	Analysis by business sectors/divisions/functions (e.g. extraction and production/mining, refining, sales, corporate)	2
	Analysis by business processes/activities (e.g. operations, productions/manufacturing, delivery products/transport/distribution)	1
	No analysis	0

Table 4.5: System of Scoring – Relevance for Mining of Coal and Lignite; Extraction of Peat Sector (continued)

$RELE_i$	Relevance Indicators	Score
$RELE_{6.3}$	**Presenting an analysis of total or some of ODS emissions per unit of output/energy intensity/energy efficiency:**	**1**
	Analysis per unit of output e.g. consumption per kWh of energy produced, consumption per tonne of production	1
	No analysis	0
$RELE_{6.4}$	**Reporting on the impacts arising from their ODS emissions:**	**2**
	In quantitative monetary terms (e.g. £, $, etc.)	2
	In qualitative terms	1
	No disclosure on the impacts arising from their ODS emissions	0
$RELE_{6.5}$	**Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives to reduce ODS emissions:**	**1**
	Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives to reduce ODS emissions	1
	No reporting	0
$RELE_{6.6}$	**Specification of quantitative targets/timelines for the measures to mitigate the impacts and/or of any initiatives to reduce ODS emissions:**	**2**
	Specification of short term quantitative targets/timelines (e.g. next year)	2
	Specification of long term quantitative targets/timelines (e.g. more than a year hence)	1
	No specification of quantitative targets/timelines	0
$RELE_7$	**ACID RAIN AND SMOG PRECURSOR EMISSIONS**	**11**
	Reporting at least one of acid rain and smog precursor emissions:	
	Acid rain and smog precursors: sulphur dioxide (SO_2), nitrous oxides (NO_x), ammonia (NH_3) and carbon monoxide (CO)	
$RELE_{7.1}$	**Reporting on total or some of acid rain and smog precursor emissions:**	**2**
	In quantifiable terms (tonnes, kilograms)	2
	In qualitative terms (e.g. consider that it is a substantial part of business and/or associate this with environmental impact)	1

Table 4.5: System of Scoring – Relevance for Mining of Coal and Lignite; Extraction of Peat Sector (continued)

$RELE_i$	Relevance Indicators	Score
	No disclosure on acid rain and smog precursor emissions	0
$RELE_{7.2}$	**Presenting an analysis of total or some of acid rain and smog precursor emissions by sector and by process:**	**3**
	Analysis of both	3
	Analysis by business sectors/divisions/functions (e.g. extraction and production/mining, refining, sales, corporate)	2
	Analysis by business processes/activities (e.g. operations, productions/manufacturing, delivery products/transport/distribution)	1
	No analysis	0
$RELE_{7.3}$	**Presenting an analysis of total or some of acid rain and smog precursor emissions per unit of output/energy intensity/energy efficiency:**	**1**
	Analysis per unit of output e.g. consumption per kWh of energy produced, consumption per tonne of production	1
	No analysis	0
$RELE_{7.4}$	**Reporting on the impacts arising from their acid rain and smog precursor emissions:**	**2**
	In quantitative monetary terms (e.g. £, $, etc.)	2
	In qualitative terms	1
	No disclosure on the impacts arising from their acid rain and smog precursor emissions	0
$RELE_{7.5}$	**Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives to reduce acid rain and smog precursor emissions:**	**1**
	Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives to reduce the acid rain and smog precursor emissions	1
	No reporting	0
$RELE_{7.6}$	**Specification of quantitative targets/timelines for the measures to mitigate the impacts and/or of any initiatives to reduce acid rain and smog precursor emissions:**	**2**
	Specification of short term quantitative targets/timelines (e.g. next year)	2
	Specification of long term quantitative targets/timelines (e.g. more than a year hence)	1

Table 4.5: System of Scoring – Relevance for Mining of Coal and Lignite; Extraction of Peat Sector (continued)

$RELE_i$	Relevance Indicators	Score
	No specification of quantitative targets/timelines	0
$RELE_8$	**OTHER SIGNIFICANT EMISSIONS TO AIR AND LAND** *Reporting at least one of all metal emissions to air, volatile organic compounds (VOCs), metal emissions to land and pesticides and fertilisers:* Metal emissions to air: lead (Pb), mercury (Hg), cadmium (Cd), arsenic (As) and nickel (Ni) Volatile organic compounds (VOCs): trichloroethylene (TCE), tetrachloroethylene (dry cleaning fluid), trichloroethane, benzene, toluene, xylene Metal emissions to land: lead (Pb), mercury (Hg), cadmium (Cd), arsenic (As), copper (Cu), zinc (Zn) Pesticides and fertilisers: Pesticides: The term pesticide encompasses individual product types i.e. herbicides (including plant growth regulators), fungicides, microbiocides, rodenticides and various other substances used to control pests Fertilisers: The primary nutrients in fertilisers are nitrogen, phosphorus and potassium. Secondary nutrients include sulphur, magnesium and calcium.	**11**
$RELE_{8.1}$	**Metal emissions to air:** **lead (Pb), mercury (Hg), cadmium (Cd), arsenic (As) and nickel (Ni)**	*11*
$RELE_{8.1.1}$	**Reporting on total or some of metal emissions to air:** In quantifiable terms (tonnes, kilograms) In qualitative terms (e.g. consider that it is a substantial part of business and/or associate this with environmental impact) No disclosure on metal emissions to air	2 2 1 0
$RELE_{8.1.2}$	**Presenting an analysis of total or some of metal emissions to air by sector and by process:** Analysis of both Analysis by business sectors/divisions/functions (e.g. extraction and production/mining, refining, sales, corporate) Analysis by business processes/activities (e.g. operations, productions/manufacturing, delivery products/transport/distribution) No analysis	3 3 2 1 0

Table 4.5: System of Scoring – Relevance for Mining of Coal and Lignite; Extraction of Peat Sector (continued)

$RELE_i$	Relevance Indicators	Score
$RELE_{8.1.3}$	**Presenting an analysis of total or some of metal emissions to air per unit of output/energy intensity/energy efficiency:**	1
	Analysis per unit of output e.g. consumption per kWh of energy produced, consumption per tonne of production	1
	No analysis	0
$RELE_{8.1.4}$	**Reporting on the impacts arising from their metal emissions to air:**	2
	In quantitative monetary terms (e.g. £, $, etc.)	2
	In qualitative terms	1
	No disclosure on the impacts arising from their metal emissions to air	0
$RELE_{8.1.5}$	**Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives to reduce the metal emissions to air:**	1
	Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives to reduce the metal emissions to air	1
	No reporting	0
$RELE_{8.1.6}$	**Specification of quantitative targets/timelines for the measures to mitigate the impacts and/or of any initiatives to reduce the metal emissions to air:**	2
	Specification of short term quantitative targets/timelines (e.g. next year)	2
	Specification of long term quantitative targets/timelines (e.g. more than a year hence)	1
	No specification of quantitative targets/timelines	0
$RELE_{8.2}$	**Volatile organic compound (VOC) emissions: trichloroethylene (TCE), tetrachloroethylene (dry cleaning fluid), trichloroethane, benzene, toluene, xylene**	*11*
$RELE_{8.2.1}$	**Reporting on total or some of VOC emissions:**	2
	In quantifiable terms (tonnes, kilograms)	2
	In qualitative terms (e.g. consider that it is a substantial part of business and/or associate this with environmental impact)	1
	No disclosure on VOC emissions	0

Table 4.5: System of Scoring – Relevance for Mining of Coal and Lignite; Extraction of Peat Sector (continued)

$RELE_i$	Relevance Indicators	Score
$RELE_{8.2.2}$	**Presenting an analysis of total or some of VOC emissions by sector and by process:**	3
	Analysis of both	3
	Analysis by business sectors/divisions/functions (e.g. extraction and production/mining, refining, sales, corporate)	2
	Analysis by business processes/activities (e.g. operations, productions/manufacturing, delivery products/transport/distribution)	1
	No analysis	0
$RELE_{8.2.3}$	**Presenting an analysis of total or some of VOC emissions per unit of output/energy intensity/energy efficiency:**	1
	Analysis per unit of output e.g. consumption per kWh of energy produced, consumption per tonne of production	1
	No analysis	0
$RELE_{8.2.4}$	**Reporting on the impacts arising from their VOC emissions:**	2
	In quantitative monetary terms (e.g. £, $, etc.)	2
	In qualitative terms	1
	No disclosure on the impacts arising from their VOC emissions	0
$RELE_{8.2.5}$	**Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives to reduce VOC emissions:**	1
	Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives to reduce the VOC emissions	1
	No reporting	0
$RELE_{8.2.6}$	**Specification of quantitative targets/timelines for the measures to mitigate the impacts and/or of any initiatives to reduce VOC emissions:**	2
	Specification of short term quantitative targets/timelines (e.g. next year)	2
	Specification of long term quantitative targets/timelines (e.g. more than a year hence)	1
	No specification of quantitative targets/timelines	0
$RELE_{8.3}$	**Metal emissions to land:**	***11***

Table 4.5: System of Scoring – Relevance for Mining of Coal and Lignite; Extraction of Peat Sector (continued)

$RELE_i$	Relevance Indicators	Score
	lead (Pb), mercury (Hg), cadmium (Cd), arsenic (As), copper (Cu), zinc (Zn)	
$RELE_{8.3.1}$	**Reporting on total or some of metal emissions to land:**	**2**
	In quantifiable terms (tonnes, kilograms)	2
	In qualitative terms (e.g. consider that it is a substantial part of business and/or associate this with environmental impact)	1
	No disclosure on metal emissions to land	0
$RELE_{8.3.2}$	**Presenting an analysis of total or some of metal emissions to land by sector and by process:**	**3**
	Analysis of both	3
	Analysis by business sectors/divisions/functions (e.g. extraction and production/mining, refining, sales, corporate)	2
	Analysis by business processes/activities (e.g. operations, productions/manufacturing, delivery products/transport/distribution)	1
	No analysis	0
$RELE_{8.3.3}$	**Presenting an analysis of total or some of metal emissions to land per unit of output/energy intensity/energy efficiency:**	**1**
	Analysis per unit of output e.g. consumption per kWh of energy produced, consumption per tonne of production	1
	No analysis	0
$RELE_{8.3.4}$	**Reporting on the impacts arising from their metal emissions to land:**	**2**
	In quantitative monetary terms (e.g. £, $, etc.)	2
	In qualitative terms	1
	No disclosure on the impacts arising from their metal emissions to land	0
$RELE_{8.3.5}$	**Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives to reduce the metal emissions to land:**	**1**
	Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives to reduce the metal emissions to land	1
	No reporting	0
$RELE_{8.3.6}$	**Specification of quantitative targets/timelines for the measures to mitigate the impacts and/or of any initiatives to reduce the metal**	**2**

Table 4.5: System of Scoring – Relevance for Mining of Coal and Lignite; Extraction of Peat Sector (continued)

$RELE_i$	Relevance Indicators	Score
	emissions to land:	
	Specification of short term quantitative targets/timelines (e.g. next year)	2
	Specification of long term quantitative targets/timelines (e.g. more than a year hence)	1
	No specification of quantitative targets/timelines	0
$RELE_{8.4}$	**Pesticide and fertiliser emissions:** **<u>Pesticides</u>: The term pesticide encompasses individual product types i.e. herbicides (including plant growth regulators), fungicides, microbiocides, rodenticides and various other substances used to control pests** **<u>Fertilisers</u>: the primary nutrients in fertilisers are nitrogen, phosphorus and potassium. Secondary nutrients include sulphur, magnesium and calcium.**	*11*
$RELE_{8.4.1}$	**Reporting on total or some of pesticide and fertiliser emissions:**	2
	In quantifiable terms (tonnes, kilograms)	2
	In qualitative terms (e.g. consider that it is a substantial part of business and/or associate this with environmental impact)	1
	No disclosure on pesticide and fertiliser emissions	0
$RELE_{8.4.2}$	**Presenting an analysis of total or some of pesticide and fertiliser emissions by sector and by process:**	3
	Analysis of both	3
	Analysis by business sectors/divisions/functions (e.g. extraction and production/mining, refining, sales, corporate)	2
	Analysis by business processes/activities (e.g. operations, productions/manufacturing, delivery products/transport/distribution)	1
	No analysis	0
$RELE_{8.4.3}$	**Presenting an analysis of total or some of pesticide and fertiliser emissions per unit of output/energy intensity/energy efficiency:**	1
	Analysis per unit of output e.g. consumption per kWh of energy produced, consumption per tonne of production	1
	No analysis	0
$RELE_{8.4.4}$	**Reporting on the impacts arising from their pesticide and fertiliser emissions:**	2

Table 4.5: System of Scoring – Relevance for Mining of Coal and Lignite; Extraction of Peat Sector (continued)

$RELE_i$	Relevance Indicators	Score
	In quantitative monetary terms (e.g. £, $, etc.)	2
	In qualitative terms	1
	No disclosure on the impacts arising from their pesticide and fertiliser emissions	0
$RELE_{8.4.5}$	**Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives to reduce the pesticide and fertiliser emissions:**	1
	Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives to reduce the pesticide and fertiliser emissions	1
	No reporting	0
$RELE_{8.4.6}$	**Specification of quantitative targets/timelines for the measures to mitigate the impacts and/or of any initiatives to reduce the pesticide and fertiliser emissions:**	2
	Specification of short term quantitative targets/timelines (e.g. next year)	2
	Specification of long term quantitative targets/timelines (e.g. more than a year hence)	1
	No specification of quantitative targets/timelines	0
$RELE_9$	**SIGNIFICANT DISCHARGES TO WATER** *Reporting on major/significant discharges to water:* Major discharges to water e.g. nutrients and organic pollutants: Nutrients and organic pollutants include contaminants, such as: polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), hexachlorocyclohexanes (HCH), benzene, toluene, Xylene, ethylbenzene, dioxins, phenols Metal emissions to water: arsenic (As), cadmium (Cd), chromium (Cr), copper (Cu), mercury (Hg), nickel (Ni), lead (Pb), zinc (Zn)	**7**
$RELE_{9.1}$	**Major discharges to water e.g. nutrients and organic pollutants, other contaminants**	***7***
$RELE_{9.1.1}$	**Reporting on total or some of major discharges to water and/or the quality of discharged water (i.e. suspended solid, heavy metals, other contaminants):**	2
	In quantifiable terms (tonnes, kilograms, m^3, total organic carbon (TOC), chemical oxygen demand (COD), biochemical oxygen demand	2

Table 4.5: System of Scoring – Relevance for Mining of Coal and Lignite; Extraction of Peat Sector (continued)

$RELE_i$	Relevance Indicators	Score
	(BOD), total suspended solids (TSS or SS), aquatic oxygen demand (AOD))	
	In qualitative terms (e.g. consider that it is a substantial part of business and/or associate this with environmental impact)	1
	No disclosure on major discharges to water	0
$RELE_{9.1.2}$	**Reporting on the impacts arising from their discharges to water:**	**2**
	In quantitative monetary terms (e.g. £, $, etc.)	2
	In qualitative terms	1
	No disclosure on the impacts arising from their discharges to water	0
$RELE_{9.1.3}$	**Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives to reduce the discharges to water:**	**1**
	Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives to reduce the discharges to water	1
	No reporting	0
$RELE_{9.1.4}$	**Specification of quantitative targets/timelines for the measures to mitigate the impacts and/or of any initiatives to reduce the discharges to water:**	**2**
	Specification of short term quantitative targets/timelines (e.g. next year)	2
	Specification of long term quantitative targets/timelines (e.g. more than a year hence)	1
	No specification of quantitative targets/timelines	0
$RELE_{9.2}$	**Metal emissions to water:** **arsenic (As), cadmium (Cd), chromium (Cr), copper (Cu), mercury (Hg), nickel (Ni), lead (Pb), zinc (Zn)**	*7*
$RELE_{9.2.1}$	**Reporting on total or some of metal emissions to water:**	2
	In quantifiable terms (tonnes, kilograms)	2
	In qualitative terms (e.g. consider that it is a substantial part of business and/or associate this with environmental impact)	1
	No disclosure on metal emissions to water	0

Table 4.5: System of Scoring – Relevance for Mining of Coal and Lignite; Extraction of Peat Sector (continued)

$RELE_i$	Relevance Indicators	Score
$RELE_{9.2.2}$	**Reporting on the impacts arising from their metal emissions to water:**	2
	In quantitative monetary terms (e.g. £, $, etc.)	2
	In qualitative terms	1
	No disclosure on the impacts arising from their metal emissions to water	0
$RELE_{9.2.3}$	**Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives to reduce the metal emissions to water:**	1
	Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives to reduce the metal emissions to water	1
	No reporting	0
$RELE_{9.2.4}$	**Specification of quantitative targets/timelines for the measures to mitigate the impacts and/or of any initiatives to reduce the metal emissions to water:**	2
	Specification of short term quantitative targets/timelines (e.g. next year)	2
	Specification of long term quantitative targets/timelines (e.g. more than a year hence)	1
	No specification of quantitative targets/timelines	0
$RELE_{10}$	**WASTE** *Reporting on waste by type and waste management method/route:* Hazardous waste: non municipal Non-hazardous waste: municipal (e.g. household) waste and office waste (e.g. paper, cardboard, plastic and metal packaging and organic materials)	**7**
$RELE_{10.1}$	**Hazardous (apart from radioactive) and non-hazardous waste**	*7*
$RELE_{10.1.1}$	**Reporting on total or some of waste produced by type and waste management method/route:**	2
	In quantifiable terms (tonnes, kilograms, litres)	2
	In qualitative terms (e.g. consider that it is a substantial part of business and/or associate this with environmental impact)	1

Table 4.5: System of Scoring – Relevance for Mining of Coal and Lignite; Extraction of Peat Sector (continued)

$RELE_i$	Relevance Indicators	Score
	No disclosure on waste produced	0
$RELE_{10.1.2}$	**Reporting on the impacts arising from their waste produced:**	**2**
	In quantitative monetary terms (e.g. £, $, etc.)	2
	In qualitative terms	1
	No disclosure on the impacts arising from their waste produced	0
$RELE_{10.1.3}$	**Reporting on any planned or implemented measures/initiatives to minimise/reduce the waste produced and/or to reuse/recycle waste:**	**1**
	Reporting on any planned or implemented measures/initiatives to minimise/reduce the waste produced and/or to reuse/recycle of waste	1
	No reporting	0
$RELE_{10.1.4}$	**Specification of quantitative targets/timelines for the measures/initiatives to minimise/reduce the waste produced and/or to reuse/recycle waste:**	**2**
	Specification of short term quantitative targets/timelines (e.g. next year)	2
	Specification of long term quantitative targets/timelines (e.g. more than a year hence)	1
	No specification of quantitative targets/timelines	0
$RELE_{10.2}$	**Hazardous waste: radioactive waste**	*7*
$RELE_{10.2.1}$	**Reporting on total radioactive waste produced:**	2
	In quantifiable terms (tonnes, kilograms of low, intermediate, or high level waste)	2
	In qualitative terms (e.g. consider that it is a substantial part of business and/or associate this with environmental impact)	1
	No disclosure on total radioactive waste produced	0
$RELE_{10.2.2}$	**Reporting on the impacts arising from their radioactive waste produced:**	2
	In quantitative monetary terms (e.g. £, $, etc.)	2
	In qualitative terms	1

Table 4.5: System of Scoring – Relevance for Mining of Coal and Lignite; Extraction of Peat Sector (continued)

$RELE_i$	Relevance Indicators	Score
	No disclosure on the impacts arising from their radioactive waste produced	0
$RELE_{10.2.3}$	**Reporting on any planned or implemented measures/initiatives to minimise/reduce the radioactive waste produced:**	1
	Reporting on any planned or implemented measures/initiatives to minimise/reduce the radioactive waste produced	1
	No reporting	0
$RELE_{10.2.4}$	**Specification of quantitative targets/timelines for the measures/initiatives to minimise/reduce the radioactive waste produced:**	2
	Specification of short term quantitative targets/timelines (e.g. next year)	2
	Specification of long term quantitative targets/timelines (e.g. more than a year hence)	1
	No specification of quantitative targets/timelines	0
$RELE_{11}$	**SIGNIFICANT SPILLS**	**7**
	Reporting on major/significant spills of at least one of the following caused from the organisation's activities:	
	Chemicals	
	Oils	
	Fuels	
	Tailings, slimes or other significant process materials	
$RELE_{11.1}$	**Reporting on total or some of major spills:**	2
	In quantifiable terms (tonnes, kilograms, m^3, litres, barrels of oil equivalent, etc.)	2
	In qualitative terms (e.g. consider that it is a substantial part of business and/or associate this with environmental impact)	1
	No disclosure on total or some of major spills	0
$RELE_{11.2}$	**Reporting on the impacts arising from their spills:**	2
	In quantitative monetary terms (e.g. £, $, etc.)	2
	In qualitative terms	1
	No disclosure on the impacts arising from their spills	0

Table 4.5: System of Scoring – Relevance for Mining of Coal and Lignite; Extraction of Peat Sector (continued)

$RELE_i$	Relevance Indicators	Score
$RELE_{11.3}$	**Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives to reduce spills:**	**1**
	Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives to reduce spills	1
	No reporting	0
$RELE_{11.4}$	**Specification of quantitative targets/timelines for the measures to mitigate the impacts and/or of any initiatives to reduce spills:**	**2**
	Specification of short term quantitative targets/timelines (e.g. next year)	2
	Specification of long term quantitative targets/timelines (e.g. more than a year hence)	1
	No specification of quantitative targets/timelines	0
$RELE_{12}$	**SUPPLIERS**	2
	Initiatives for suppliers to adopt the same environmental standards:	
$RELE_{12.1}$	**Reporting on planned or implemented initiatives/policies/programmes aimed at encouraging suppliers to apply the same environmental standards:**	1
	Reporting on planned or implemented initiatives/policies/programmes aimed at encouraging suppliers to apply the same environmental standards	1
	No reporting	0
$RELE_{12.2}$	**Reporting on information of priorities, level of implementation and/or on monitoring and enforcement practices in the planned or implemented initiatives/policies/programmes, so as to encourage suppliers to apply same environmental standards:**	1
	Reporting on information of priorities, level of implementation and/or on monitoring and enforcement practices in the planned or implemented initiatives/policies/programmes, so as to encourage suppliers to apply same environmental standards	1
	No reporting	0
$RELE_{13}$	**PRODUCTS AND SERVICES**	**6**

Table 4.5: System of Scoring – Relevance for Mining of Coal and Lignite; Extraction of Peat Sector (continued)

$RELE_i$	Relevance Indicators	Score
$RELE_{13.1}$	**Reporting on major environmental impacts of company principal/major/key products and/or services:**	**2**
	In quantitative monetary terms (e.g. £, $, etc.)	2
	In qualitative terms	1
	No disclosure on the impacts of company products and/or services	0
$RELE_{13.2}$	**Reporting on planned or implemented measures/initiatives/policies/programmes to mitigate the impact (i.e. initiatives to improve product design and lessen impacts associated with manufacturing, use/consumption and disposal, such as initiatives: to reduce GHGs intensity of energy products, related to an eco-labelling scheme[(a)], aimed at increasing awareness of customers about environmental issues of principal/major/key products and/or services and/or initiatives to promote responsible consumption):**	**1**
	Reporting on planned or implemented measures/initiatives/policies/programmes to mitigate the impact (i.e. initiatives to improve product design and lessen impacts associated with manufacturing, use/consumption and disposal, such as initiatives: to reduce GHGs intensity of energy products, related to an eco-labelling scheme[(a)], aimed at increasing awareness of customers about environmental issues of principal/major/key products and/or services and/or initiatives to promote responsible consumption)	1
	No reporting	0
$RELE_{13.3}$	**Specification of quantitative targets/timelines for the measures/initiatives/policies/programmes to mitigate the impact (i.e. initiatives to improve product design and lessen impacts associated with manufacturing, use/consumption and disposal, such as initiatives: to reduce GHGs intensity of energy products, related to an eco-labelling scheme[(a)], aimed at increasing awareness of customers about environmental issues of principal/major/key products and/or services and/or initiatives to promote them responsible consumption):**	**2**
	Specification of short term quantitative targets/timelines (e.g. next year)	2
	Specification of long term quantitative targets/timelines (e.g. more than a year hence)	1
	No specification of quantitative targets/timelines	0
$RELE_{13.4}$	**Reporting on percentage of products sold/packaging materials that are recyclable/reusable:**	**1**
	Reporting on percentage of products sold/packaging materials that are recyclable/reusable	1
	No reporting	0

Table 4.5: System of Scoring – Relevance for Mining of Coal and Lignite; Extraction of Peat Sector (continued)

$RELE_i$	Relevance Indicators	Score
$RELE_{14}$	**COMPLIANCE**	**5**
$RELE_{14.1}$	**Reporting on non-compliance with environmental laws and regulations incidents (e.g. having fines and/or penalties) or on compliance with relevant environmental laws and regulations, by stating that the company has no fines and/or penalties:**	**2**
	In quantitative monetary terms (e.g. £, $, etc.) or stating that the company has no fines and/or penalties	2
	In qualitative terms	1
	No disclosure on non-compliance with environmental laws and regulations incidents (fines and/or penalties) or on compliance with relevant environmental laws and regulations, by stating that the company has no fines and/or penalties	0
$RELE_{14.2}$	**Reporting on any remedial actions planned to improve/prevent the incidents:**	**1**
	Reporting on any remedial actions planned to improve/prevent the incidents	1
	No reporting	0
$RELE_{14.3}$	**Specification of quantitative targets/timelines for the remedial actions planned to improve/prevent the incidents:**	**2**
	Specification of short term quantitative targets/timelines (e.g. next year)	2
	Specification of long term quantitative targets/timelines (e.g. more than a year hence)	1
	No specification of quantitative targets/timelines	0
$RELE_{15}$	**TRANSPORTATION**	**5**
$RELE_{15.1}$	**Reporting on environmental impacts of transportation used for logistical purposes and/or used for members of the workforce transferring/transporting purposes:**	**2**
	In quantitative monetary terms (e.g. £, $, etc.)	2
	In qualitative terms	1
	No disclosure on the environmental impacts of transportation used for logistical purposes and/or used for members of the workforce transferring/transporting purposes	0

Table 4.5: System of Scoring – Relevance for Mining of Coal and Lignite; Extraction of Peat Sector (continued)

$RELE_i$	Relevance Indicators	Score
$RELE_{15.2}$	**Reporting on any efforts to reduce the impacts of transportation used for logistical purposes and/or used for members of the workforce transferring/transporting purposes:**	1
	Reporting on any efforts to reduce the impacts of transportation used for logistical purposes and/or used for members of the workforce transferring/transporting purposes	1
	No reporting	0
$RELE_{15.3}$	**Specification of quantitative targets/timelines for the efforts to reduce the impacts of transportation used for logistical purposes and/or used for members of the workforce transferring/transporting purposes:**	2
	Specification of short term quantitative targets/timelines (e.g. next year)	2
	Specification of long term quantitative targets/timelines (e.g. more than a year hence)	1
	No specification of quantitative targets/timelines	0
$RELE_{16}$	**RISKS AND LIABILITIES**	**10**
	Reporting on:	
	Risks and liabilities arising from the organisation's activities	
	Risks to business itself: climate risk, risks from weather conditions, natural disaster/catastrophe likelihood, etc.	
$RELE_{16.1}$	**Risks and liabilities arising from the organisation's activities:**	***5***
$RELE_{16.1.1}$	**Reporting on environmental risks and liabilities arising from business activities:**	**2**
	In quantitative monetary terms (e.g. £, $, etc.)	2
	In qualitative terms	1
	No disclosure on the environmental risks and liabilities arising from business activities	0
$RELE_{16.1.2}$	**Reporting on any initiatives to cope with/mitigate such risks/liabilities (e.g. engaging with financial instruments/insurance to cover environmental risks/liabilities, indicating any work towards reducing the risks/liabilities):**	**1**
	Reporting on any initiatives to cope with/mitigate such risks/liabilities (e.g. engaging with financial instruments/insurance to cover	1

Table 4.5: System of Scoring – Relevance for Mining of Coal and Lignite; Extraction of Peat Sector (continued)

$RELE_i$	Relevance Indicators	Score
	environmental risks/liabilities, indicating any work towards reducing the risks/liabilities)	
	No reporting	0
$RELE_{16.1.3}$	**Specification of quantitative targets/timelines for the initiatives to cope with/mitigate such risks/liabilities:**	**2**
	Specification of short term quantitative targets/timelines (e.g. next year)	2
	Specification of long term quantitative targets/timelines (e.g. more than a year hence)	1
	No specification of quantitative targets/timelines	0
$RELE_{16.2}$	**Risks to business itself (e.g. climate risk, risks from weather conditions, natural disaster/catastrophe likelihood, etc.):**	***5***
$RELE_{16.2.1}$	**Reporting on policies/programmes/designated management levels for consideration of such risks and reporting on such risks, segmented by type of risks:**	**2**
	In quantitative monetary terms (e.g. £, $, etc.) (regarded as commercial risks)	2
	In qualitative terms	1
	No disclosure on the policies/programmes/designated management levels for consideration of such risks and reporting on such risks, segmented by type of risks	0
$RELE_{16.2.2}$	**Reporting on any initiatives to cope with/mitigate such risks (e.g. engaging with financial instruments/insurance to cover environmental risks):**	**1**
	Reporting on any initiatives to cope with/mitigate such risks (e.g. engaging with financial instruments/insurance to cover environmental risks)	1
	No reporting	0
$RELE_{16.2.3}$	**Specification of quantitative targets/timelines for the initiatives to cope with/mitigate such risks:**	**2**
	Specification of short term quantitative targets/timelines (e.g. next year)	2
	Specification of long term quantitative targets/timelines (e.g. more than a year hence)	1
	No specification of quantitative targets/timelines	0

Table 4.5: System of Scoring – Relevance for Mining of Coal and Lignite; Extraction of Peat Sector (continued)

$RELE_i$	Relevance Indicators	Score
	MAXIMUM TOTAL SCORE	**150**

(a) Eco-labelling scheme, in this case, means any schemes relating to a labelling system for company products that can help avoid detrimental effects on the environment and/or enable customers to choose greener products or identify those that have come from a sustainable source (European Commission, 2007b).
(b) The penultimate column contains the maximum scores for the main items and the italicised scores are the sub total maxima within these, which are employed in the weighting process, as discussed below.

DEFRA and GRI Supplements Weighting Approach

99 percent of the maximum possible score (M_j), which varies across sectors, is allocated to components i = 1.1 to 15.3, with the last one percent going to item 7b in table 4.3, namely, risks and liabilities to and from the environment. Moreover, an equal weight of 49.5 is given to all the components specified by DEFRA (2006, p.65-74) and the GRI Supplements (GRI, 2003, 2005a, 2005b, 2006a, 2007, 2008a, 2008b), where available and where the latter do not exist the full weight of 99 percent is awarded to the DEFRA relevance components.

Because DEFRA ranks the environmental issues in terms of their level of impact, as explained above, the 49.5 percent or 99 percent (where no GRI Guidelines supplement is available) of M_j is further weighted according to this as follows. Following the classification of issues in table 4.4, the weight for the score $\sum(RELE_i)_{i_f}$ with a maximum of $m_{RELE_{i_f}}$ for the most significant item, where i_f refers to the first or second digit of the topic, is $\frac{n_D}{1+2+3+...+n_D}$, where n_D is a total number of topics specified by DEFRA. That for the second most important is $\frac{n_D-1}{1+2+3+...+n_D}$, the third most is $\frac{n_D-2}{1+2+3+...+n_D}$ and the least significant issue is $\frac{1}{1+2+3+...+n_D}$.

For the GRI Supplements specific topics, each is given an equal weight, i.e. $\frac{1}{n_G}$, where n_G is the total number of items specified in the supplements. Where there is overlap of the items identified by DEFRA and the GRI, having applied these formulae the weighted scores are added together. Subsequently, the scores for the overlapping and separate GRI items are aggregated to achieve the total, to a maximum of 99 percent.

The final component scores (i = 16.1.1 to 16.2.3) are added together and allocated one percent of the overall weighting, as explained above, thus the total relevance score for that firm is provided by the summation of the 99 percent allocation figure with this one.

Subsequently, the overall score for $RELE_j$ is presented as:

$$
\begin{aligned}
RELE_j = & \left\{ \begin{array}{l}
\left\{ \left[M_j \right] \times \left[\frac{\sum \left(RELE_i \right)_{i_f}}{m_{RELE_{i_f}}} \right] \times \left[\left(0.495 \times \frac{n_D}{1+2+3+\ldots+n_D} \right) + \left(0.495 \times \frac{1}{n_G} \right) \right] \right\} + \\
\left\{ \left[M_j \right] \times \left[\frac{\sum \left(RELE_i \right)_{i_f}}{m_{RELE_{i_f}}} \right] \times \left[\left(0.495 \times \frac{n_D - 1}{1+2+3+\ldots+n_D} \right) + \left(0.495 \times \frac{1}{n_G} \right) \right] \right\} + \\
\left\{ \left[M_j \right] \times \left[\frac{\sum \left(RELE_i \right)_{i_f}}{m_{RELE_{i_f}}} \right] \times \left[\left(0.495 \times \frac{n_D - 2}{1+2+3+\ldots+n_D} \right) + \left(0.495 \times \frac{1}{n_G} \right) \right] \right\} + \ldots + \\
\left\{ \left[M_j \right] \times \left[\frac{\sum \left(RELE_i \right)_{i_f}}{m_{RELE_{i_f}}} \right] \times \left[\left(0.495 \times \frac{1}{1+2+3+\ldots+n_D} \right) + \left(0.495 \times \frac{1}{n_G} \right) \right] \right\}
\end{array} \right\} + \\
& \left\{ \left[\left(M_j \right) \times \left(\frac{\sum \left(RELE_i \right)_{i_f}}{m_{RELE_{i_f}}} \right) \times \left(0.495 \times \frac{1}{n_G} \right) \right] + \ldots + \left[\left(M_j \right) \times \left(\frac{\sum \left(RELE_i \right)_{i_f}}{m_{RELE_{i_f}}} \right) \times \left(0.495 \times \frac{1}{n_G} \right) \right] \right\} + \\
& \left\{ \left[M_j \right] \times \left[\frac{\sum \left(RELE_{16.1.1} + RELE_{16.1.2} + \ldots + RELE_{16.2.3} \right)}{m_{RELE_{16}}} \right] \times \left[0.01 \right] \right\}
\end{aligned}
$$

…… (2)

The following formula provides a specific example from applying this weighting formula to achieve the overall relevance score for the case of a firm in the mining of coal and lignite; extraction of peat sector.

$$RELE_{j_{10}} = \left\{ \begin{array}{l} \left\{ [150] \times \left[\frac{\sum (RELE_{1.1} + \ldots + RELE_{1.6})}{11} \right] \times \left[\left(0.495 \times \frac{6}{1+2+3+\ldots+6} \right) + \left(0.495 \times \frac{1}{12} \right) \right] \right\} + \\ \left\{ [150] \times \left[\frac{\sum (RELE_{5.1.1} + \ldots + RELE_{5.3.6})}{33} \right] \times \left[\left(0.495 \times \frac{5}{1+2+3+\ldots+6} \right) + \left(0.495 \times \frac{1}{12} \right) \right] \right\} + \\ \left\{ [150] \times \left[\frac{\sum (RELE_{3.1} + \ldots + RELE_{3.6})}{11} \right] \times \left[\left(0.495 \times \frac{4}{1+2+3+\ldots+6} \right) + \left(0.495 \times \frac{1}{12} \right) \right] \right\} + \\ \left\{ [150] \times \left[\frac{\sum (RELE_{8.3.1} + \ldots + RELE_{8.3.6})}{11} \right] \times \left[0.495 \times \frac{3}{1+2+3+\ldots+6} \right] \right\} + \\ \left\{ [150] \times \left[\frac{\sum (RELE_{7.1} + \ldots + RELE_{7.6})}{11} \right] \times \left[\left(0.495 \times \frac{2}{1+2+3+\ldots+6} \right) + \left(0.495 \times \frac{1}{12} \right) \right] \right\} + \\ \left\{ [150] \times \left[\frac{\sum (RELE_{10.1.1} + \ldots + RELE_{10.1.4})}{7} \right] \times \left[\left(0.495 \times \frac{1}{1+2+3+\ldots+6} \right) + \left(0.495 \times \frac{1}{12} \right) \right] \right\} \end{array} \right\} +$$

$$\left\{ \begin{array}{l} \left[(150) \times \left(\frac{\sum (RELE_{2.1} + \ldots + RELE_{2.7})}{13} \right) \times \left(0.495 \times \frac{1}{12} \right) \right] + \\ \left[(150) \times \left(\frac{\sum (RELE_{4.1} + \ldots + RELE_{4.4})}{7} \right) \times \left(0.495 \times \frac{1}{12} \right) \right] + \\ \left[(150) \times \left(\frac{\sum (RELE_{6.1} + \ldots + RELE_{6.6})}{11} \right) \times \left(0.495 \times \frac{1}{12} \right) \right] + \\ \left\{ \left[(150) \times \left(\frac{\sum (RELE_{9.1.1} + \ldots + RELE_{9.1.4})}{7} \right) \times \left(0.495 \times \frac{1}{12} \right) \right] + \right\} + \\ \left[(150) \times \left(\frac{\sum (RELE_{11.1} + \ldots + RELE_{11.4})}{7} \right) \times \left(0.495 \times \frac{1}{12} \right) \right] + \\ \left[(150) \times \left(\frac{\sum (RELE_{13.1} + \ldots + RELE_{13.4})}{6} \right) \times \left(0.495 \times \frac{1}{12} \right) \right] + \\ \left[(150) \times \left(\frac{\sum (RELE_{14.1} + \ldots + RELE_{14.3})}{5} \right) \times \left(0.495 \times \frac{1}{12} \right) \right] \end{array} \right\}$$

$$\left\{ [150] \times \left[\frac{\sum (RELE_{16.1.1} + RELE_{16.1.2} + \ldots + RELE_{16.2.3})}{10} \right] \times [0.01] \right\}$$

…… (3)

Overall Score Standardisation across Sectors

In order to standardise the different overall scores across industrial sectors and to provide equal weighting for each of the four characteristics, as discussed later in the section regarding the total CER quality measure, the overall calculated $RELE_j$ for each

of the industry sectors is scaled down so that the maximum score is 25, i.e. $= RELE_j \times \frac{25}{M_j}$.

4.4 Reliability

4.4.1 Reliability of Financial Information

Not much progress has been made in the extant empirical research on assessing the reliability of accounting information, which may well be because the financial statements under the financial reporting conceptual frameworks (such as those of FASB, ASB and IASB) have to be audited and this implies that the users can rely on the authenticity of the information (Maines and Wahlen, 2006). This would appear to indicate that the reliability of accounting information can be assessed through its verifiability, which is simply revealed in auditors' reports. Therefore, regarding the reliability of financial reports the issue of concern is auditor independence when they are involved in their verification.

However, a few authors have measured the reliability of certain aspects of financial information, such as whether firms give fair values of investment securities by considering their corresponding market values. For example, Alford and Boatsman (1995) used the measure of the volatility of historical long-term stock return to examine the accuracy of reported estimates of expected future return volatility employed by companies to calculate the fair values of employee stock options. That is, they studied the differences in the two expected return volatility measures and elicited that such differences (in other words, materiality of the errors) provide the degree of reliability in the information on employee stock options. Thus, these results imply that the reliability of particular accounting information can be determined by comparing such information with the disclosures of independent and verifiable benchmark data.

In addition, several studies have provided evidence on the reliability of accounting information by examining its relation with future cash flows (e.g. Barth et al., 2001b;

Beaver and Engel, 1996; Dechow and Dichev, 2002; McNichols and Wilson, 1988; Petroni, 1992). These researchers assumed that a strong relationship between particular accounting estimated numbers (such as loss reserves or working capital accruals) and realised future cash flows indicates a high level of reliability of the accounting information. In particular, the results of these studies implied that there is a strong link between prior period accrual estimates and the subsequent realisations assist the users of financial statements to assess the reliability of these estimates. However, there is a difficulty in this approach, for where the outcomes have been found to have a weak correlation, this could suggest: low reliability (as poor representation faithfulness) of the studied accounting information or inherent randomness in future cash flow realisations, or irrelevance of the particular accounting information for the particular cash flow realisations (Maines and Wahlen, 2006) and hence, no firm conclusion can be drawn as to their interpretation.

Moreover, some empirical studies have indicated that the degree of risk and uncertainty inherent in future cash flows affects the reliability of related accounting information (e.g. Jorion, 2002; Liu et al., 2004; Rajgopal, 1999; Schrand, 1997). That is, after determining the association of value-at-risk disclosures of accounting information with future income/cash flows volatility, the findings from these works showed that the degree of the association signifies the reliability of the accounting information. Where the value-at-risk disclosures are the recognised amounts of certain assets and/or liabilities that are subject to uncertainty, such as market price risk or potential volatility in future income and cash flows.

Furthermore, several value-relevance studies have used share prices to explain whether accounting information is considered both adequately relevant and reliable to capital market participants for their investment decision making (e.g. Barth, 1991; Barth et al., 2001a; Choi et al., 1997). These researchers have commonly assessed the relevance and reliability of accounting information by examining the strength of the relationship between particular accounting numbers (such as earnings, pension assets and liabilities, non-pension accumulated post-retirement benefits obligations) and share prices. More specifically, using share price as a proxy for expected future cash flows, they believe that these relevance and reliability measures test the investors' sensitivity to the relevance of accounting information for a company's future cash flows and also their

perception of the reliability of its accounting information. However, it has been argued that it is too simple to draw inferences about the reliability of accounting information from these studies (Maines and Wahlen, 2006). That is, even though a strong association between particular accounting numbers and share prices would appear to suggest that the capital markets depend on corporate measures of the accounting numbers as they perceive them to convey relevance and reliability regarding the prediction of future returns, there is no hard and fast evidence to support this view (Schipper and Vincent, 2003). In particular, management manipulation could misleadingly increase the explanatory power of such information (Schipper and Vincent, 2003). Hence, it appears that it is improbable that this approach provides an accurate measure of the reliability of accounting information.

4.4.2 Principles of Reliability in CER

Firstly, it is noted that corporate financial reports are obliged to be verified by independent auditors. Therefore, here an adaptation of the use of external verification from financial statements reporting, which involves determining whether the CER is subjected to external audit, is employed to test the reliability as part of the content analysis. Secondly, in line with the underlying basis from financial reporting empirical work, where it is taken that the disclosures of independent and verifiable benchmarks signify the reliability of information, a comparison between the disclosed environmental information (e.g. pollution release data, such as greenhouse gas emissions) with that available from independent organisation's databases is also used to complement the measure of CER reliability. That is, this comparison will indicate the faithfulness and neutrality elements of the informational reliability. In this regard, according to legitimacy theory a company may decide to manipulate actual performance to deflect attention from problematic areas and hence it is important to make such comparisons so as to establish the reliability of a particular company's reporting.

Thirdly, the measure of reliability of financial information of linking prior period information with subsequent realisations could also be adapted to incorporate the measure of CER reliability, as it would indicate informational representation faithfulness, neutrality and completeness. That is, targets of environmental performance

in the prior period (such as greenhouse gas emission targets) could be reconciled with the actual information for the following period. However, the pilot study of the empirical work for this research revealed that it was unrealistic to apply this reconciliation concept.[19]

In addition, building on previous empirical work on the content of the disclosed information, the key environmental issues for different industrial sectors are taken into account in the analysis so as to provide the completeness element of the reliability of CER. Lastly, based on the prudence attribute of reliability adapted from the financial reporting frameworks, the disclosure of environmental risks and any quantifiable uncertainties (e.g. the estimates of future incomes or expenses), which have also been included as indicators for the relevance characteristic above, is also incorporated to measure CER reliability, as described below.

4.4.3 Scoring System for the Content Analysis – Reliability

The reliability score for firm *j* and its report for the period *t*, $RELI_{jt}$, is the sum of the scores of the component reliability measures, $RELI_{ijt}$, for that report, i.e.

$$RELI_{jt} = \sum_i RELI_{ijt}$$

and the component measures are summarised in table 4.6.

As explained above, the first set of components (i = 1.1 to 2.6) refer to the degree to which a company uses external verification and the information relating to their reporting in this regard, if they do so. The next component (i = 3) reflects the elements of: information faithfulness, level of neutrality and the degree of freedom from bias in the reporting. The subsequent component (i = 4) indicates the completeness of the disclosure, which depends on a range of significant topics for each of the industry sectors as illustrated in table 4.4 and the detailed scoring system for this is given in the appendix 3. The last components (i = 5.1.1 to 5.2.3) reflect the prudence feature of the

[19] Unfortunately, the pilot study showed that only 1 in 10 companies disclosed next year target information in their emissions data (i.e. Royal Dutch Shell Plc) and also these were only available in the 2004 and 2005 reports and not those for 2006. Therefore, measuring reliability using the target realisations is unrealistic for the study period in this research and thus is excluded from the analysis. Nevertheless, this gives a promising avenue for future research.

disclosed information, which covers environmental risks and liabilities, both to the public and to the business itself. All the components are scored as shown in table 4.6.

Table 4.6: System of Scoring – Reliability

$RELI_i$	Reliability Indicators	Score
$RELI_1$	**EXTERNAL VERIFICATION**	
$RELI_{1.1}$	**Environmental/Annual report contains a verification statement by an external audit/verifier organisation:**	**3**
	Report contains a verification statement by an independent external audit/verifier organisation	3
	Report contains a verification statement by an external financial auditor	2
	Report that the organisation has provided external assurance (by either an independent external audit/verifier, external financial auditor, or someone else) to confirm that the data contained in the report have been asked to review with no verification statement or any assurance report	1
	Report contains nothing about external audit verification	0
$RELI_2$	**VERIFICATION STATEMENT**	
$RELI_{2.1}$	**Environmental/Annual report contains a verification statement which provides confirmation that the data contained in the report is accurate and reflected in the report's quantitative analysis:**	**2**
	The verification statement provides confirmation that the data contained in the environmental/annual report is accurate and reflected in the report's quantitative analysis	2
	The verification statement does not provide confirmation that the data contained in the environmental/annual report is accurate and reflected in the report's quantitative analysis, but does provide a general opinion on this matter (e.g. whether the report gives sufficient information, whether the report is fairly stated, etc.)	1
	The verification statement does not provide any confirmation about the data contained in the environmental/annual report	0
$RELI_{2.2}$	**Environmental/Annual report contains a verification statement which provides specific details about what data was assessed:**	**1**
	The verification statement provides specific details about what data was assessed by the verifier	1
	The verification statement does not provide specific details about what data was assessed by the verifier	0
$RELI_{2.3}$	**Environmental/Annual report contains a verification statement which provides the assessment process (e.g. data collection, aggregation, compilation):**	**1**
	The verification statement provides the assessment process (e.g. data collection, aggregation, compilation)	1

Table 4.6: System of Scoring – Reliability (continued)

$RELI_i$	Reliability Indicators	Score
	The verification statement does not provide the assessment process (e.g. data collection, aggregation, compilation)	0
$RELI_{2.4}$	**Environmental/Annual report contains a verification statement which includes information that an external verifier reviews progress against the organisation's policy commitments:**	**1**
	The verification statement contains information that an external verifier reviews progress against the organisation's policy commitments	1
	The verification statement does not contain information that an external verifier reviews progress against the organisation's policy commitments	0
$RELI_{2.5}$	**Environmental/Annual report contains a verification statement which includes information that an external verifier assesses the adequacy of the organisation's management systems and/or risk management procedure:**	**1**
	The verification statement contains information that an external verifier assesses the adequacy of the organisation's management systems and/or risk management procedure	1
	The verification statement does not contain information that an external verifier assesses the adequacy of the organisation's management systems and/or risk management procedure	0
$RELI_{2.6}$	**Environmental/Annual report contains a verification statement which includes information that an external verifier reviews progress against performance targets:**	**1**
	The verification statement contains information that an external verifier reviews progress against performance targets	1
	The verification statement does not contain information that an external verifier reviews progress against performance targets	0
$RELI_3$	**REPRESENTATION FAITHFULNESS/NEUTRALITY/FREE FROM BIAS**	
	Reconciliation of data shown in organisation's environmental/annual report with data from the CDP:	**3**
	Company responded to CDP questionnaire, providing full GHGs emissions data (in tonnes CO_2 equivalent), with there being no material discrepancies between the GHGs emissions data (in tonnes CO_2 equivalent) in their environmental/annual report and in the CDP	3
	Company responded to CDP questionnaire, providing full GHGs emissions data (in tonnes CO_2 equivalent), with there being material discrepancies (≥10%) between the GHGs emissions data (in tonnes CO_2 equivalent) in their environmental/annual report and in the CDP	2
	Company responded to the CDP questionnaire, but did not provide full GHGs emissions data (in tonnes CO_2 equivalent)	1

Table 4.6: System of Scoring – Reliability (continued)

$RELI_i$	Reliability Indicators	Score
	Company did not respond to the CDP questionnaire (NR) or they responded but the data is not publicly available (NP) or they declined to participate in the questionnaire (DP) or reconciliation was not possible as no full GHGs emissions data (in tonnes CO_2 equivalent) was provided in their environmental/annual report	0
$RELI_4$	**COMPLETENESS**	
	Information shown in organisation environmental/annual report covers the entire range of significant issues[(a)]:	**3**
	Reporting on:	
	All ranges of significant issues (Full disclosure)	3
	Some ranges of significant issues (Disclosure of some issues)	2
	A limited range of significant issues (Disclosure of a limited range of significant issues)	1
	No disclosure or only a very limited range of significant issues are covered	0
$RELI_5$	**PRUDENCE[(b)]: RISKS AND LIABILITIES**	
	Reporting on:	
	Risks and liabilities arising from the organisation's activities	
	Risks to business itself: climate risk, risks from weather conditions, natural disaster/catastrophe likelihood, etc.	
$RELI_{5.1}$	**Risks and liabilities arising from the organisation's activities:**	
$RELI_{5.1.1}$	**Reporting on the environmental risks and liabilities arising from business activities:**	**2**
	In quantitative monetary terms (e.g. £, $, etc.)	2
	In qualitative terms	1
	No disclosure on the environmental risks and liabilities arising from business activities	0
$RELI_{5.1.2}$	**Reporting on any initiatives to cope with/mitigate such risks/liabilities (e.g. engaging with financial instruments/insurance to cover environmental risks/liabilities):**	**1**

Table 4.6: System of Scoring – Reliability (continued)

$RELI_i$	Reliability Indicators	Score
	Reporting on any initiatives to cope with/mitigate such risks/liabilities (e.g. engaging with financial instruments/insurance to cover environmental risks/liabilities)	1
	No reporting	0
$RELI_{5.1.3}$	**Specification of targets/timelines for the initiatives to cope with/mitigate such risks/liabilities:**	**2**
	Specification of short term targets/timelines (e.g. next year)	2
	Specification of long term targets/timelines (e.g. more than a year hence)	1
	No specification of targets/timelines	0
$RELI_{5.2}$	**Risks to business itself (e.g. climate risk, risks from weather conditions, natural disaster/catastrophe likelihood, etc.):**	
$RELI_{5.2.1}$	**Reporting on policies/programmes/designated management levels for consideration of such risks and reporting on such risks, segmented by type of risks:**	**2**
	In quantitative monetary terms (e.g. £, $, etc.) (regarded as commercial risks)	2
	In qualitative terms	1
	No disclosure on the policies/programmes/designated management levels for consideration of such risks and reporting on such risks, segmented by type of risks	0
$RELI_{5.2.2}$	**Reporting on any initiatives to cope with/mitigate such risks (e.g. engaging with financial instruments/insurance to cover environmental risks):**	**1**
	Reporting on any initiatives to cope with/mitigate such risks (e.g. engaging with financial instruments/insurance to cover environmental risks)	1
	No reporting	0
$RELI_{5.2.3}$	**Specification of targets/timelines for the initiatives to cope with/mitigate such risks:**	**2**
	Specification of short term targets/timelines (e.g. next year)	2
	Specification of long term targets/timelines (e.g. more than a year hence)	1
	No specification of targets/timelines	0

Table 4.6: System of Scoring – Reliability (continued)

$RELI_i$	Reliability Indicators	Score
	MAXIMUM TOTAL SCORE	**26**

(a) The indicators regarding the completeness aspect of reliability and the score ($RELI_4$) for each industry sector are drawn from the significant issues attributed to the relevance characteristic, as shown in table 4.4. A detailed scoring system of this component for each of the industry sectors is given in the appendix 3.
(b) Prudence aspect of reliability indicators and score ($RELI_5$) can also be seen as signifying predictive value, which is an element of the relevance indicators and score, that is $RELI_5$ is equal $RELE_{16}$ where: $RELI_{5.1} = RELE_{16.1}$ ($RELI_{5.1.1} = RELE_{16.1.1}$, $RELI_{5.1.2} = RELE_{16.1.2}$ and $RELI_{5.1.3} = RELE_{16.1.3}$) and $RELI_{5.2} = RELE_{16.2}$ ($RELI_{5.2.1} = RELE_{16.2.1}$, $RELI_{5.2.2} = RELE_{16.2.2}$ and $RELI_{5.2.3} = RELE_{16.2.3}$).

4.5 Comparability and Consistency

4.5.1 Comparability and Consistency of Financial Information

Concerning comparability and consistency of financial data contained in corporate published financial reports, the relevant financial reporting frameworks highlight the importance of such matters, both within a company over time and between companies. With regards to the former, the frameworks require, for example, all preparers to follow the same implementation or estimation guidance so that easy year on year comparisons of a firm's accounting figures can be made. Regarding the latter, comparability of financial information between companies within an individual country has not received much attention, because companies have to follow the same accounting standards as laid down in the statutes. In addition, the auditors' opinions already verify the conformity of their clients' reporting with the country's generally accepted accounting practice/principles and thus, a harmonisation of financial reporting practices within a country is already implicit.

However, some attention has been paid to comparisons across countries, involving investigations into the differences in accounting practices (for example, UK GAAP, US GAAP and IASs) and empirical surveys on the differences in financial reporting under different accounting standards among countries (e.g. Archer et al., 1995; van der Tas, 1992; Weetman et al., 1998). In particular, these academics have developed indices to enable them to make these comparisons, which are based on the differences in national accounting systems, rather than individual company financial statements. The results have revealed that there are substantial differences in the financial information reported under the different national accounting standards and thus suggests that accounting practices are not comparable for all countries.

4.5.2 Principles of Comparability and Consistency in CER

Turning to comparability and consistency of CER practices, the approach of developing an index to investigate the information disclosure comparability cannot be applied. This is because environmental information is not reported according to a set standard, but rather is reported voluntarily and variously among companies. In addition, even if a comparability index could be developed, such an approach would require the comparison of particular information on CER to the exclusion other facts that could be of relevance and hence, would not provide comprehensive results.

For the above reasons, therefore it is posited that a test of comparability and consistency (within a company and between companies in the same sector in a specific country) regarding CER has to rely on a comparison of the range of disclosed items in each reporting year. More specifically, on the one hand the within firm analysis involves comparing 2005 with 2004 and 2006 with 2005, whereas on the other hand the inter-firm study covers comparison with the benchmark company for the same year configuration. As shown in chapter 2, several CER researchers (e.g. Belkaoui and Karpik, 1989; Brammer and Pavelin, 2006b; Gamble et al., 1996, Guthrie and Parker, 1990) have measured CER disclosure as a whole by this approach, but here it is used to measure the comparability and consistency characteristic of CER quality. In particular, by considering the CER items of relevance according to the different industrial sectors, as suggested by DEFRA (2006, p.65-74) and in the GRI Supplements (GRI, 2003, 2005a, 2005b, 2006a, 2007, 2008a, 2008b), this enhances the robustness of the results. The set of issues for each sector is the same as that employed for the relevance measures as shown in table 4.4.

4.5.3 Scoring System for Content Analysis – Comparability and Consistency

The comparability and consistency score for firm j and its report for the period t, C_{jt}, is the sum of the scores on the component comparability and consistency measures, C_{ijt}, for that report, i.e.

$$C_{jt} = \sum_i C_{ijt}$$

and the component measures are summarised in table 4.7.

For the reasons given above, the first component (i = 1.1) refers to a within comparability and consistency of information with regards to specific issues for each of the industry sectors, as demonstrated in the table 4.4. That is, this is to establish whether or not the topics covered in the disclosed information are shown as being comparable and consistent with the practice of the previous year. The second component (i = 1.2) reflects the comparability and consistency of the topics coverage across firms in a similar sector and that of industry leaders is used as a base for firms in each sector. Further, the coverage from the second largest firm in the industry is employed to score this component for the leader firms itself and the scoring system for each firm is shown in table 4.7.

Table 4.7: System of Scoring – Comparability and Consistency

C_i	Comparability and Consistency Indicators	Score
C_1	**COMPARABILITY AND CONSISTENCY OF THE APPROPRIATE RANGE OF SIGNIFICANT ISSUES[(a)]**	
$C_{1.1}$	**Within company year by year:**	**1**
	Reporting on the same lists of issues year by year (compared with last year reporting)	1
	Reporting on different lists of issues year by year (compared with last year reporting) or does not report any of the significant issues in either year	0
$C_{1.2}$	**Between companies in the sector:**	**1**
	Reporting on the same list of issues as the largest company in the sector in the same year or in the case of it being the largest, comparing it with the second biggest	1
	Reporting on different lists of issues to other companies using the same procedure or not reporting any of the significant issues in either company	0
	MAXIMUM TOTAL SCORE	**2**

(a) The significant issues of each industry sector for measuring comparability and consistency are derived from the completeness aspect of the reliability characteristic ($RELI_4$) for each sector, which is the same as that in table 4.4, used to assess relevance.

4.6 The Total CER Quality Measure

As discussed in chapter 3, financial reporting frameworks and the GRI Guidelines for CER do not prioritise one or a subset of the qualitative characteristics of reported information, but rather they envisage the need for a balance among all of them, thereby emphasising the fact that one cannot be a substitute for another. Consequently, the

measures of each qualitative characteristic ($CERQ_{jt}$) are given equal weight here when compiling the total measure of CER quality, Q_{jt}, i.e. each characteristic has a 25 percent influence over the total CER quality measure and hence, a simple additive procedure is employed to calibrate this. However, given the characteristic measures have different maximum scores they have to be rescaled to a common metric prior to this aggregation. In order to yield a total score with a valid range from 0 to 100, each characteristic is therefore rescaled to a range of 0 to 25. Thus, a standard scalar is used respectively for the *U*, *RELI* and *C* measures, but the scalar applied to the *RELE* score depends on the maximum available for the sector in which the particular firm operates (M_j) and hence the total CER quality score is given by:

$$Q_{jt} = U_{jt} \times \frac{25}{109} + RELE_{jt} \times \frac{25}{M_j} + RELI_{jt} \times \frac{25}{26} + C_{jt} \times \frac{25}{2} \quad \text{..... (4)}$$

Consequently, the standardised total score from the measures of each qualitative characteristic out of 25 is employed for the analyses of the study, rather than the raw figure.

4.7 The Independent Variables

Organisational Size

The measure of each company's size is defined as the natural logarithm of the value of a firm's total assets[20] at the end of the fiscal year *t*, which has widely been employed in previous studies and is extracted for the relevant accounting period from Osiris, the publicly available database. The US dollar (USD) is used for a firm's total assets, thus a spot exchange rate[21] to transform GBP or Euro values as at the end of fiscal year *t* is

[20] A measure of size based on the natural logarithm of firm market capitalisation value is also tested. The comparative results (of the use of both the natural logarithm of firm total assets values and market capitalisation), which are used in some of the empirical analysis are presented in chapter 5.

[21] The spot exchange rate is obtained from the Bank of England database.

applied. Natural logged values are used so as to minimise the impact of extreme values and reduce heteroskedasticity.

Industry Sector

The main activity of each company by industry sector (equivalent to C, D, E, F, G, H, I, J, K and O of the ISIC Rev.3.1 categorisation) is also obtained from Osiris. Moreover, each firm is allocated to one of ten grouped sectors, rather than the two digit classification shown in table 4.4, those of: mining and quarrying (hereafter mining); manufacturing; electricity, gas and water supply (hereafter utilities); construction; wholesale and retail trade, repair of motor vehicles, motorcycles and personal and household goods (hereafter trade); hotels and restaurants; transport, storage and communications (hereafter transport); financial intermediation (hereafter finance); real estate, renting and business activities (hereafter real estate); and other community, social and personal service activities (hereafter other service activities). Each industrial sector is set as a categorical variable and is assigned a score of one to ten in the above order, for a company *j*, in year *t*. In the analyses, the omitted sectoral variable is that for mining.

Country of: Domicile, Shares Listed and Operation

A binary dummy variable indicates a firm's country of domicile, for which the score of one is given if a company *j* is domiciled in the UK in year *t* and zero if it is domiciled in the US in year *t*.

The data on the country(ies) where a company's shares are listed is also taken from Osiris or from its annual reports where necessary. This indicates the breadth of a firm's shareholders and hence, the potential demand for environmental information and regarding this, a dummy variable is developed, which shows if a company is cross-listed in another country(ies) apart from their country of domicile, under the assumption that this indicates a higher level of pressures for environmental information disclosure than were it otherwise. That is, for the relevant accounting period a value of one is given if a

company *j*'s shares are listed in a country(ies) other than its country of domicile in year *t* and zero otherwise.

Geographical segment data extracted from Osiris and segmental reporting shown in corporate annual reports are used to produce financial information (sales revenue, operational profit and total assets[22]), split between that inside and outside a company's home region.[23] By obtaining data regarding the extent to which a company generates revenue, gains operational profit and holds assets outside its home region (Europe for UK companies and Northern America for US companies), this would indicate the level of a firm's environmental exposure. That is, it is assumed here that the higher these types of activities outside the home region then the greater the exposure to environmental concerns and the greater the breadth of the potential stakeholders based outside the home region. A set of variables showing the proportion of company revenue, operational profit and net assets in a country(ies) outside the company's home region out of the total were created, but owing to insufficient data for segmental operational profit and total assets these were excluded from the study. A suitable proxy for the extent of company international operations is therefore considered to be the proportion of sales revenue outside a company's home region out of the total for the relevant accounting period. That is to say, it is measured by the proportion of total revenue that company *j* generates in any other countries outside its home region in year *t*.

Financial Performance

[22] USD is used for all values of the firm sales revenue, operational profit and total assets. Hence a spot or a year average exchange rate to transform GBP or Euro values as at the end of (or for the period of) fiscal year *t* is applied, where appropriate. The rate is obtained from the Bank of England database. With regards to a year average rate, if the firm has its fiscal year end on 31 September 2005 this is calculated from the summation of day spot rates from 1 October 2004 to 31 September 2005 divided by the total number of days that have these rates.

[23] Financial information inside and outside the home region is used owing to the insufficient dataset in relation to country-segmental financial information. The principle of classifying countries by region follows the United Nations statistics of "Geographical region and composition" (United Nations, 2010a), which divides the world into: Africa, Latin America and the Caribbean, Northern America, Asia, Europe and Oceania (Australia and New Zealand, Melanesia, Micronesia, and Polynesia). The United Nations statistics for economic groupings such as "Developed and developing regions" (United Nations, 2010a) was initially proposed, but owing to the insufficient and unharmonised dataset for country-segmental financial information, it was rejected.

A measure of firm financial performance (firm profitability), return on shareholder funds or return on equity (ROE)[24], for the relevant accounting period, is also obtained from Osiris. Net income is not used as it is shown in absolute terms without taking into account the size of a company and thus does not adequately reflect company financial performance. That is, relating profit with a company's total investment or owners' investment is more appropriate. Moreover, return on total assets (ROA), a scale profit according to a company's investment in total assets, is not used since it may be biased, because the sample includes companies from different industries, which have different types, levels and ages of fixed assets. Therefore, return on shareholder funds or ROE for year *t* is used as a proxy for firm profitability in this study.

Environmental Performance

It would be ideal if all the sample companies reported similar measures of environmental performance, for then this could be used as the data for this study, but the reality is that the sample firms reported various angles of environmentally related performance. Previous related studies have also variously measured environmental performance.[25] However, owing to the fact that CO_2-equivalent emissions data is the most commonly reported measure of environmental performance and is a negative externality that is not fully internalised, it is therefore used as a proxy for this in this research. In this regard, CO_2-equivalent emissions data for year *t*, the relevant

[24] According to the Osiris definition, the return on shareholder funds (%) (Data code: 31010) is defined as the percentage of profits/losses before tax divided by shareholder funds. In this study this is taken as the return on equity (ROE) and considered as a measure of firm financial performance. However, the term ROE in the Osiris calculation refers to profits/losses for a period (net income) as a numerator. ROE in this study is therefore materially different from that of Osiris and to avoid any confusion, the term "return on shareholder funds" from Osiris is synonymous with ROE in this research.

[25] Measures of environmental performance in existing work have included: using a reputational index (Belkaoui and Karpik, 1989), which relied heavily on companies rating their selves on their degree of social and/or environmental responsibility rather than the level of organisational effectiveness; undisclosed or unclear principle of external organisation ratings, such as the Council on Economic Priorities' (CEP) environmental performance ratings (Rockness, 1985) and the Ethical Investment Research Service (EIRIS) ratings (Brammer and Pavelin, 2004); environmental data from external databases, such as the ratio of toxic waste recycled to toxic waste generated gathered from the Corporate Environmental Profiles Directory published annually by the Investor Responsibility Research Centre (IRRC) (Al-Tuwaijri et al., 2004), which limits the extent of the enquiry and consideration of aggregated fines data (Brammer and Pavelin, 2006a, 2006b), which is problematic, because there is a mismatch between this data coverage, in terms of time and the information disclosure period and this type of data only considers those activities being fully internalised into financial statements.

accounting period[26], are extracted from the corporate response obtained from the CDP database, one of the most accessible databases for socially and environmentally related reporting. Nevertheless, using CO_2-equivalent emissions data from the CDP places a limitation on this study, because only those providing complete responses can be included in the sample.[27]

Rather than using its absolute value, the emissions figure is standardised by obtaining it as a proportion of one million USD operating revenue, thus making comparisons between firms meaningful and subsequently, the natural logarithm of this value is calculated for the analysis. Operating revenue value for year *t* is obtained from Osiris and the year average exchange rate[28] is used to transform GBP or Euro values of these into USD values. Once the logarithmic value is calibrated, its inverse serves as a proxy for the environmental performance of companies in years 2005 and 2006.

Accounting System

The measure of a firm's financial accounting system is the same as that for the firm's domicile country variable. That is to say, a binary dummy variable is used, where a score of one is allocated if a company *j* follows a principles-based system (the UK reporting) in year *t* and zero if it applies a rules-based system (the US reporting).

GRI Guidelines Application

Information regarding whether or not a company applies the GRI Guidelines for their environmental disclosures is obtained from CorporateRegister.com[29], a website

[26] CO_2-equivalent emissions data for 2005 and 2006 are obtained from corporate CDP4 2006 and CDP5 2007 responses, unless stated otherwise in the questionnaire replies. That is, where necessary supplementary data is obtained from CDP3 2005 (mostly 2004 data) and CDP6 2008 (mostly 2007 data) for the relevant accounting period.

[27] In some cases, a company answered an incomplete questionnaire, with limited or no emissions data, whilst in others permission for public access to their responses was not granted.

[28] Year average exchange rate is also calculated from data obtained from the Bank of England database.

[29] Available at: http://www.corporateregister.com (Accessed: 2 May 2008).

containing a global directory of corporate social and environmental reporting related resources. More specifically, these data are taken from the CSR Report Directory through the GRI Guidelines Register tab, which covers all reports from its directory that follow these Guidelines and although they are specified in terms of the different versions, i.e. G1 (GRI, 2000), G2 (GRI, 2002) and G3 (GRI, 2006b), which were available at the commencement of this study, here what is of concern is whether any of them have been used. A value of one is assigned if a company *j* applied any of them in their environmental disclosure for year *t*, the relevant accounting period, and zero otherwise.

Independent Environmental Ratings

The sustainability index according to each home country, as at the end of the calendar year *t*, is used as a proxy for independent environmental ratings[30], That is, FTSE4Good UK, a UK sustainability index, is used for the UK companies and the DJSI United States Index is used for those of the US. A value of one is given if a company is listed in such an index for year *t* and zero otherwise and the data obtained from the constituents lists of the indices refers to 31 December in year *t*.

Year

The reporting year is set as a categorical variable, with a value of one being given to signify that the corporate report is for the year 2005 (year $t = 1$) and two for the year 2006 (year $t = 2$). Recall the two-year sample period from 2005 to 2006 of this study, it is posited that the inclusion of this control variable provides richer analysis due to the fact that the latest updated version of GRI Guidelines at the commencement of this study, the most widely accepted broader CER reporting guidelines, and the DEFRA

[30] The Dow Jones Sustainability World Index (DJSI World) was initially proposed as a proxy for environmental reporting ratings from other organisations. However, it is likely that several UK companies from the sample were not covered by this, because this only "covers the top 10% of the biggest 2,500 companies in the Dow Jones World Index in terms of economic, environmental and social criteria." (SAM Indexes GmbH., 2006) Consequently, this would have reduced the sample size and, hence measures specific to the UK and the US were used as alternatives.

guidelines, were launched in 2006 and hence a change in the level of CER is expected between these two years.

Table 4.8 summarises the definitions of the independent variables, these being: firm-specific characteristics, environmental performance, accounting system, as well as showing the control variables employed.

Table 4.8: Definition of Variables

Variables of Firm *j* for Year *t*	Definitions	Symbols
Organisational size	Natural logarithm of total assets (or natural logarithm of market capitalisation) of firm *j* for year *t*	$SIZE_{jt}$
Industry sector	Of firm *j* in year *t*: 1 = mining[(a)]; 2 = manufacturing; 3 = utilities; 4 = construction[(b)]; 5 = trade; 6 = hotels and restaurants[(c)]; 7 = transport; 8 = finance; 9 = real estate; and 10 = other service activities	$INDUSTRY10_{jt}$: $INDMining_{jt}$[(a)], $INDManu_{jt}$, $INDUtilities_{jt}$, $INDConstruct_{jt}$[(b)], $INDTrade_{jt}$, $INDHotel_{jt}$[(b)], $INDTransport_{jt}$, $INDFinance_{jt}$, $INDRealEstate_{jt}$, $INDOthers_{jt}$
Country:		
Country of domicile	1 = firm *j* domiciled in the UK in year *t*, 0 = firm *j* domiciled in the US in year *t*	$COUNTRY_{jt}$
Country(ies) where firm's shares are listed: cross-listing of shares indicates a high magnitude of demand for environmental information by a firm's financial stakeholders.	1 = firm *j*'s shares listed in another country(ies) apart from its country of domicile in year *t*, 0 = firm *j*'s shares non-listed in another country(ies) apart from its country of domicile in year *t*	$CROSS\ LISTING_{jt}$
Country(ies) where firm has operated in: proportion of sales revenue outside a firm's home region indicates level of its environmental exposure and the greater the breadth of the potential stakeholder based outside the home region.	(Sales revenue outside firm *j*'s home region for year *t*/total sales revenue of firm *j* for year *t*)*100	$SALES\ OUTS_{jt}$

Table 4.8: Definition of Variables (continued)

Variables of Firm *j* for Year *t*	Definitions	Symbols
Financial performance: profitability	Return on shareholder funds or ROE of firm *j* for year *t*	$FIN\ PERF_{jt}$
(Inverse of) Environmental performance	Natural logarithm of: tonnes of CO_2-equivalent emissions of firm *j* for year *t*/$1ml operating revenue of firm *j* for year *t*	$EMISSIONS_{jt}$
Accounting system	1 = firm *j* used principles-based system (the UK reporting) in year *t*, 0 = firm *j* applied rules-based system (the US reporting) in year *t*	$COUNTRY_{jt}$
GRI Guidelines application	1 = firm *j* applied G1 (GRI, 2000), G2 (GRI, 2002) or G3 (GRI, 2006b) in their CER for year *t*, 0 = firm *j* did not apply G1 (GRI, 2000), G2 (GRI, 2002) or G3 (GRI, 2006b) in their CER for year *t*	$GRI\ APP_{jt}$
Independent environmental ratings	1 = UK firm *j* listed in the FTSE4Good UK for year *t* or US firm *j* listed in the DJSI United States Index for year *t*, 0 = UK firm *j* non-listed in the FTSE4Good UK for year *t* or US firm *j* non-listed in the DJSI United States Index for year *t*	$INDEX_{jt}$
Year	1 = year 2005 reporting, 2 = year 2006 reporting	$YEAR_{jt}$

(a) Mining is an omitted sectoral variable.
(b) Companies in industry 4 = construction are excluded from the sample of some of the empirical studies, because the relevant data (environmental performance data) are missing.
(c) Companies in industry 6 = hotels and restaurants are excluded from the sample of some of the empirical studies, because the relevant data (environmental performance data) are missing.

4.8 Analytical Methods

4.8.1 Determinants of Variation in CER Quality

As explained previously, the aim of the empirical investigation in this research is to test the validity of a CER framework derived from the financial reporting frameworks by examining the main CER determinants, taken from existing theories, for four types of CER qualitative characteristics and total/overall CER quality. The dependent variables are modelled as a function of the aforementioned firm-specific characteristics, environmental performance and the accounting system, x_{jt}. Some factors, i.e. GRI

Guidelines application, independent environmental ratings and reporting year, are also included as control variables. Accordingly, the regression model is expressed as:

$$CERQ_{jt} = \beta x'_{jt} + (\nu_j + \varepsilon_{jt}) \quad \text{..... (5)}$$

where j = 1,…, Nth firm; t = 2005, 2006. $CERQ_{jt}$ is the measure for each qualitative characteristic for the j^{th} firm at time t. β is the vector of the parameters on x_{jt}, the independent variables that vary across individuals and time. ν_j is an individual effect, which contains a constant term (α) and a set of firm-specific time-invariant variables and is assumed to be purely random and uncorrelated with the independent variables and ε_{jt} is the disturbance term. The combined error is $\mu_{jt} = \nu_j + \varepsilon_{jt}$. Estimation of the parameters on the explanatory variables is then undertaken using a feasible generalised least squares (FGLS) estimator, a random-effects model, as shown in equation (5). With regards to this, the explanation is provided as follows.

Despite the fact that the pooled tobit estimation is a common technique for a study with censored dependent variables, as is the case here, this method may fail to account for time invariant firm-specific heterogeneity owing to the data being short-panel in form. Failure to control for heterogeneity will cause the parameter estimation to be biased and inconsistent and may lead to inappropriate conclusions (Baltagi, 2005). The only panel estimator available is the random-effects (RE) option (Cameron and Trivedi, 2010) and random-effects tobit regression was initially proposed for estimation of the parameters for the explanatory variables. However the random-effects panel tobit model relies "heavily on the assumption of homoskedastic normally distributed errors for consistency and… is more fragile to distributional misspecification than… linear models and logit models" (Cameron and Trivedi, 2010, p.631). Therefore, to account for this the tests of normality and homoskedasticity in the tobit regression of $CERQ_{jt}$ were performed, and the outcomes show a very strong rejection of the null hypotheses of normality and homoskedasticity. Consequently, a more general linear model, such as pooled ordinary least squares (OLS) estimation was considered, but this would fail to account for time invariant firm-specific heterogeneity[31] and hence, was inappropriate.

[31] The Breusch-Pagan Lagrange multiplier test for heteroskedasticity after the OLS regression of the estimators was performed and it showed its existence. In addition, once the FE and RE linear panel

To counter all these limitations, fixed-effects (FE) and random-effects (RE) linear panel estimations were next considered. In the FE model, the ν_j, random individual-specific effect that does not vary over time, is permitted to be correlated with the regressors x_{jt} and hence, taken as a firm-specific constant term and only the time-varying regressors are used in the estimation (Greene, 2003). The RE model, on the other hand, specifies that ν_j is a firm-specific random effect that is uncorrelated with the regressors x_{jt} (Greene, 2003). It therefore yields estimates of all coefficients and hence the marginal effects, including those of time-invariant and time-varying regressors, can be estimated (Cameron and Trivedi, 2010). However, the RE approach, Greene (2003, p.301) asserted, "may suffer from the inconsistency due to [the] … correlation between the included variables and the random [individual] effects". In relation to this, the Hausman test, "the specification test … for orthogonality of the random [individual] effects and the regressors" (Greene, 2003, p.301), was considered. Under the null hypothesis of this test, there is no correlation, both the FE and the RE model are consistent, but the FE estimator is inefficient, i.e. the two estimates should not differ systematically where a test is based on the difference. Once the Hausman test was performed and demonstrated the null hypothesis that the RE estimator is consistent[32], it was chosen for the analysis. In sum, the random-effects GLS regression is employed for this study under the assumptions discussed above.

Nevertheless, this researcher is aware that it could be argued that the dependent variable comparability and consistency, C_{jt} is ordinal rather than continuous. Therefore, nonlinear estimation for this ordinal panel dataset (C_{jt}), i.e. pooled ordered logistic regression, is performed, using the 'ologit' command with the 'vce(cluster id)' option to correct for error correlation over time for a given individual in STATA version 11. This model is employed, because when the random-effects ordered logistic estimation using the 'gllamm' command with the 'ologit' link was attempted, the programme was unable to generate results as the estimation failed to yield a convergence of the iterations of the estimates. In addition, more efficient tools than the pooled ordered logistic estimation, such as the population-averaged (PA) estimator using the 'xtgee' command with the

estimations were proposed, the Breusch-Pagan Lagrange multiplier test for random effects after the random effects estimations were calculated, confirmed the inappropriateness of the pooled OLS method.

[32] χ^2 = 6.487 (p = 0.5928), 7.723 (p = 0.4610), 8.264 (p = 0.4081), 7.202 (p = 0.5150) and 9.338 (p = 0.3146) for U_{jt}, $RELE_{jt}$, $RELI_{jt}$, C_{jt} and Q_{jt}, respectively.

'exchangeable' PA option to control errors for being equicorrelated, is currently unable to generate results for ordinal data.

The four CER quality indicators are alternately regressed on the firm characteristics (i.e., organisational size, industry sector, country of domicile (and thus accounting system), shares cross-listing, proportion of sales revenue outside home region and financial performance), environmental performance, GRI Guidelines application, independent environmental ratings and reporting year. Hence equation (5) is rewritten as:

$$\begin{aligned} CERQ_{jt} = {} & \alpha + \beta_1(SIZE_{jt}) + \beta_2(INDManu_{jt}) + \beta_3(INDUtilities_{jt}) + \beta_4(INDTrade_{jt}) + \\ & \beta_5(INDTransport_{jt}) + \beta_6(INDFinance_{jt}) + \beta_7(INDRealEstate_{jt}) + \beta_8(INDOthers_{jt}) + \\ & \beta_9(COUNTRY_{jt}) + \beta_{10}(CROSS\ LISTING_{jt}) + \beta_{11}(SALES\ OUTS_{jt}) + \beta_{12}(FIN\ PERF_{jt}) + \\ & \beta_{13}(EMISSIONS_{jt}) + \beta_{14}(GRI\ APP_{jt}) + \beta_{15}(INDEX_{jt}) + \beta_{16}(YEAR_{jt}) + \mu_{jt} \end{aligned}$$

……. (6)

This regression model is also applied to total CER quality, Q_{jt}.

4.8.2 Tests of CER Behaviours under Institutional Theory

Whereas the estimation equations for testing the main determinants of the variations of CER quality have been presented in the previous subsection, in this one an analytic model is introduced to shed light on the institutional theory-driven hypotheses, *H10.1* and *H10.2*, as to whether firms report their environmental information in a convergent manner over time, by comparing it with the previous year's reporting for their industry's benchmark, that is, the aim is to elicit the degree of mimetic behaviour. If it is not present, coercive behaviour of reporting or other reporting motivations are assumed. This part of the empirical analysis investigating which of these behaviours predominates is undertaken independently of the determinants and the control variables discussed in the regression model in the previous subsection.

Tests of Convergence for Mimetic/Coercive Behaviours

A Two Independent Samples T-test or a Mann-Whitney Test and a One Sample T-test or a One Sample Median Test

The sample observations are split into two subsamples based on country-specific industry position in terms of size: leaders (*L*) and followers (*F*).[33] More specifically, this relies on the assumption that the largest firm in each particular sector is seen as an industry benchmark for others to imitate, including with regards to their environmental disclosure practice. With respect to this, reporting quality itself cannot be used as the basis to divide leaders and followers as an alternative to size, because there is no means of measuring this. Moreover, according to previous studies under the lenses of the stakeholder and legitimacy theories, a firm of larger size tends to disclose more environmental information than its counterparts and is thus implicitly seen as a leader in terms of reporting.[34] Consequently, $CERQ_{jt}$, the measures of each qualitative characteristic for the leader and follower subsamples are specified as $CERQ_{jt_L}$ and $CERQ_{jt_F}$, respectively.

Basis for the Convergence Test between 2005 and 2006

The basis for testing convergence is that the quality of the reporting of the leaders' subsample is significantly higher than that of the followers in the base year, 2005. This is assessed by examining whether in 2005 (i.e., $t = 1$) the mean values of $CERQ_{jt_L}$, $\overline{CERQ_{jt_L}}$, are statistically significantly greater than the mean values of $CERQ_{jt_F}$, $\overline{CERQ_{jt_F}}$, i.e.

[33] Market capitalisation as at 31 December 2005, as given in the constituents of the FTSE100 and S&P100, was employed to categorise the country-specific leader of each industry sector. Industry sectors for specifying leader and follower subsamples are classified similarly to the relevance scoring methods of the first model, in accordance with DEFRA's "Significant Direct Key Performance Indicators" (DEFRA, 2006, p.66-74), which are equivalent to the two-digit ISIC Rev.3.1 (United Nations, 2002).

[34] It would be possible to redefine the two subsamples to test for normative behaviour by firms from the convergence of reporting practices. That is, sample observations could be divided into groups of firms that use and do not use the norm in their reporting. However, it is arguable that a uniform qualitative norm of environmental reporting is in its infancy and although the GRI Guidelines could be used for this, these are based on the content rather than the quality and for this reason normative behaviour is not included in the scope of this study. Nevertheless, the use of size could be implicitly eliciting whether or not normative behaviour is evident in the form of convergence, because those firms using the GRI Guidelines tend to be the larger ones and thus the chosen method caters to some extent for this.

$$\overline{CERQ_{j1_L}} - \overline{CERQ_{j1_F}} > 0$$

…… (7)

To compare these means for leaders and followers, a two independent samples t-test is employed. However where the $CERQ_{j1}$ is not normally distributed, the Mann-Whitney test, a non-parametric version to the independent samples t-test, is used instead to compare the difference between the underlying distributions of the $CERQ_{j1}$ of the leaders and followers. If there is a statistically significant difference between the mean (or the sum of the ranks) $CERQ_{j1}$ score for leaders and followers and the former is greater than the latter, this indicates a strong basis for reporting the results of the convergence test. Conversely, where the results suggest a weak basis for testing the disclosure convergence, i.e. the difference is not statistically significant, then this could result in coercive behaviour being observed as per institutional theory or the other motivational theories (such as the stakeholder and legitimacy theories), depending on the change in actual practices over the two-year period, a matter that is subsequently discussed.

Practices Indicating Convergence between 2005 and 2006

Where $\overline{CERQ_{j1_L}} - \overline{CERQ_{j1_F}} > 0$ [35], reporting convergence is valid if the followers' mean values of the difference in $CERQ_{jt}$ between 2005 and 2006 (i.e., t = 1 and 2, respectively), $\overline{CERQ_{j2_F} - CERQ_{j1_F}}$ are statistically significantly greater than zero. Under these circumstances, the mimetic behaviour of followers' CER is feasible. That is:

$$\overline{\Delta CERQ_{jt_F}} > 0$$

…… (8)

where t = 1 and 2.

[35] The sum of the ranks of $CERQ_{j1_L}$ > the sum of the ranks of $CERQ_{j1_F}$, if the Mann-Whitney test is employed.

To verify whether this is valid, a one sample t-test is employed to test whether the mean of the qualitative characteristic variables and the total for the followers' subsample of firms, $\overline{\Delta CERQ_{jt_F}}$ is statistically significantly different from zero. However, if the $\Delta CERQ_{jt_F}$ is not normally distributed, a one sample median test[36] is used instead, to test whether the median $\Delta CERQ_{jt_F}$ score differs significantly from zero.

More specifically, if the mean or the median of the followers' $CERQ_{jt}$ difference is statistically significantly greater than zero, i.e. $\overline{\Delta CERQ_{jt_F}} > 0$, whereas the mean or the median of the leaders' $CERQ_{jt}$ difference between the two years does not statistically significantly differ from zero, i.e. $\overline{\Delta CERQ_{jt_L}} = 0$, then convergence is observed, which is termed 'at best' under such circumstances. That is, this refers to the leader not changing its level of reporting quality, which suggests it has responded to the followers behaviour in the first year and hence, appears to have employed mimetic behaviour.[37] That is:

$$\overline{\Delta CERQ_{jt_F}} > 0 \text{ and } \overline{\Delta CERQ_{jt_L}} = 0 \qquad \ldots\ldots\ldots\ldots\ldots (9)$$

where t = 1 and 2.

To verify whether this is valid, a one sample t-test or a one sample median test, depending on the distribution of $\Delta CERQ_{jt_L}$, is also employed to test if the mean or the median of the variable $\Delta CERQ_{jt_L}$ for the leaders subsample of firms is statistically significantly different from zero.

If both the means or medians of the followers' $CERQ_{jt}$ difference and those of the leaders are statistically significantly greater than zero, then convergent practice in disclosure and hence mimicry, is only indicated for the followers. In relation to this, the leaders' practice may be explained as being consistent with the stakeholder and

[36] That is, the Wilcoxon signed-rank test.

[37] However, if the mean or median of the leaders' $CERQ_{jt}$ difference is statistically significantly smaller than zero, $\overline{\Delta CERQ_{jt_L}} < 0$, whilst that of the followers is still statistically significantly larger from zero, $\overline{\Delta CERQ_{jt_F}} > 0$, obviously, convergence and hence mimetic behaviour is present, but this is not considered to be 'at best' practice, because the leader has compromised its reporting quality.

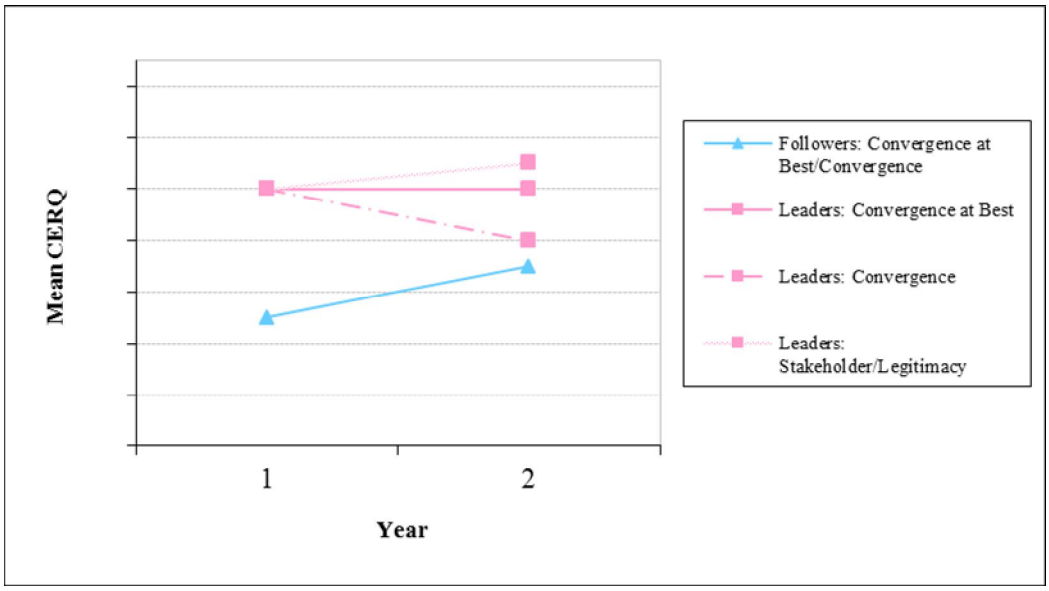
legitimacy theories, owing to public pressure for an increase in reporting quality. That is:

$$\overline{\Delta CERQ_{jt_F}} > 0 \text{ and } \overline{\Delta CERQ_{jt_L}} > 0 \quad \text{..... (10)}$$

where t = 1 and 2.

The circumstances indicating convergent practices are shown in figure 4.2 below:

Figure 4.2: Reporting Convergence



Practices Indicating non-Convergence between 2005 and 2006

As mentioned above, the weak basis for testing the reporting of convergence i.e. $\overline{CERQ_{j1_L}} - \overline{CERQ_{j1_F}} = 0$ [38] signifies the absence of mimetic reporting behaviour. However, under these circumstances it is still worth testing the two subsamples to see whether coercive behaviour is present or not over time and hence provide evidence to support institutional or other motivational theories. In this regard, where the means or medians of the $CERQ_{jt}$ difference for both of the subsamples or just one of them are statistically insignificantly larger than zero, then routine behaviour is observed for

[38] The sum of the ranks of $CERQ_{j1_L}$ = the sum of the ranks of $CERQ_{j1_F}$, if the Mann-Whitney test is employed.

that/those group(s) exhibiting no change. That is, the non-movers as per institutional theory are said to be coerced. This practice is expressed as:

$$\overline{\Delta CERQ_{jt_L}} = 0 \text{ and/or } \overline{\Delta CERQ_{jt_F}} = 0 \quad \ldots\ldots\ldots\ldots (11)$$

where t = 1 and 2.

On the other hand, if the means or medians of the $CERQ_{jt}$ difference for both of the subsamples or just one of them are statistically significantly greater than zero, influences from public pressure as per stakeholder and legitimacy theories could explain this tendency to increase quality in reporting practices. That is, either or both of the leaders and followers are being pressurised into improving the reporting quality. This is shown by:

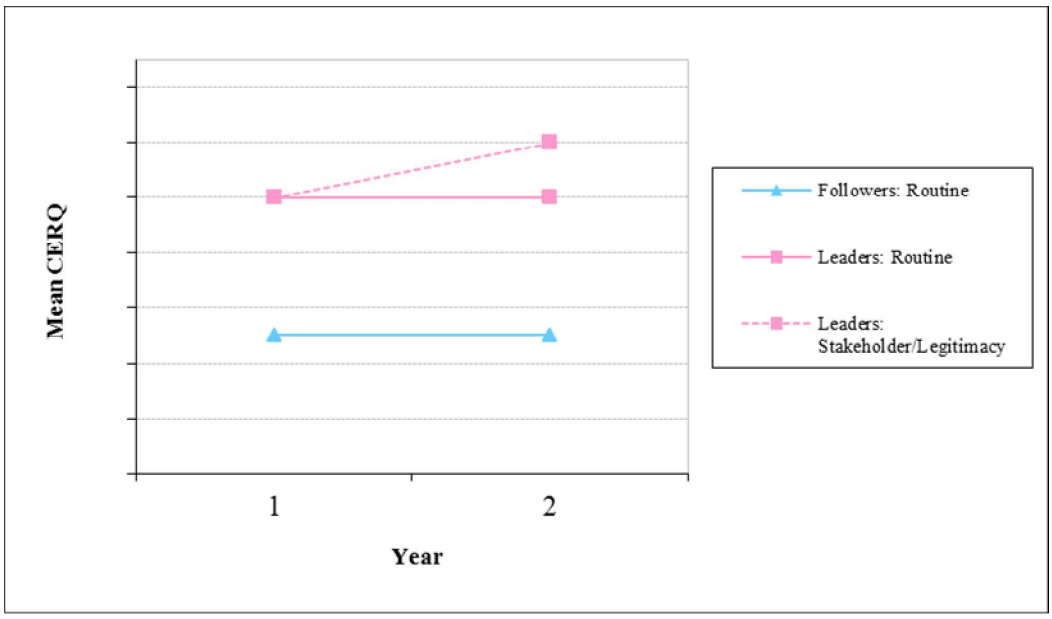
$$\overline{\Delta CERQ_{jt_L}} > 0 \text{ and/or } \overline{\Delta CERQ_{jt_F}} > 0 \quad \ldots\ldots\ldots\ldots (12)$$

where t = 1 and 2.

Apart from this where there is a strong basis for testing the reporting of convergence, i.e. $\overline{CERQ_{j1_L}} - \overline{CERQ_{j1_F}} > 0$ [39], there are cases that suggest the non-convergence of the reporting practices, in particular when the mean or median of the followers' $CERQ_{jt}$ difference does not statistically significantly differ from zero, as given in equation (11). Further, if these measures for the followers and leaders subsamples do not statistically significantly differ from zero, hence exhibiting routine reporting behaviours, coerciveness as per institutional theory can be assumed for both followers and leaders. In addition, there could be the case that only the mean or median of the followers' $CERQ_{jt}$ difference is not statistically significantly greater than zero, whereas that of leaders is and under this circumstance the coercion rests with the followers' practices and, in accordance with the equation (12) stakeholder/legitimacy theories may be employed to interpret the leaders' practices. These practices are all described in figure 4.3 below.

[39] The sum of the ranks of $CERQ_{j1_L}$ > the sum of the ranks of $CERQ_{j1_F}$, if the Mann-Whitney test is employed.

Figure 4.3: Reporting Non-Convergence



With regards to all the tests above, the relevant equations are also applied to total CER quality, Q_{jt}.

Year-Specific OLS Regressions

Following Cormier et al.'s (2005) method to test reporting convergence, i.e. mimetic behaviour as per institutional theory, next, the samples are split into two subsamples based on the years of reporting, i.e. 2005 and 2006. More specifically, $CERQ_{jt}$, the measures of each qualitative characteristic are divided into year-specific $CERQ_j$, i.e. $CERQ_{j1}$ and $CERQ_{j2}$, where t = 1 and 2 for 2005 and 2006 reporting, respectively. Moreover, the year-specific $CERQ_j$ is deflated by the country- and year-specific industry median values of $CERQ_j$ (Mdn_j), such that the dependent variable for each of the two subsamples is given by:

$$y_j = \frac{CERQ_j}{Mdn_j} \qquad \text{..... (13)}$$

where j = 1,…, Nth firm.

This year-specific dependent variable is used in year-specific OLS regressions of the form:

$$\frac{CERQ_j}{Mdn_j} = \alpha + \beta x'_j + \mu_j$$

…… (14)

where j = 1,…, Nth firm.

Proxies for the explanatory variables are those from the regression model developed in the examination of the determinants of variation in CER Quality, as covered in the previous subsection. Thus equation (14) can be rewritten as:

$$\begin{aligned}\frac{CERQ_j}{Mdn_j} = \alpha &+ \beta_1(SIZE_j) + \beta_2(INDManu_j) + \beta_3(INDUtilities_j) + \beta_4(INDTrade_j) + \\ &\beta_5(INDTransport_j) + \beta_6(INDFinance_j) + \beta_7(INDRealEstate_j) + \beta_8(INDOthers_j) + \\ &\beta_9(COUNTRY_j) + \beta_{10}(CROSS\ LISTING_j) + \beta_{11}(SALES\ OUTS_j) + \beta_{12}(FIN\ PERF_j) + \\ &\beta_{13}(EMISSIONS_j) + \beta_{14}(GRI\ APP_j) + \beta_{15}(INDEX_j) + \mu_j\end{aligned}$$

…… (15)

where j = 1,…, Nth firm.

This regression model is also applied to total CER quality, Q_j.

Following an approach similar to that of Cormier et al. (2005), the residuals from these year-specific regressions are compared and if there is a decrease in their variance (the residual mean squares, MS_R) over this two-year period, thus signifying fewer inter-firm differences in the quality of environmental disclosure, industrial imitation behaviour is assumed. That is to say, under such circumstances, having taken all the relevant and control variables into account, there is a convergence in the quality of environmental disclosure over time. To assess the significance of the convergence, Levene's test for equality of variances is employed.

4.8.3 The Interrelation between Financial and Environmental Performance

The previous two analytic methods have been undertaken under the assumption that CER quality is driven by a number of factors through various theoretical lenses according to different contexts. In this subsection, a third analytic approach is introduced to investigate the interrelation between financial and environmental performance, as per *H11.1* and *H11.2*, established in chapter 3. In relation to this, it is hypothesised that a firm's environmental performance can be influenced by its available financial resources. From a different perspective, it may be that given the level of financial resources, a firm's environmental performance, in turn, has an impact on this. To test this interrelation, first, the statistical significance of the correlation between financial ($FIN\ PERF_{jt}$) and environmental performance ($EMISSIONS_{jt}$) from the regression of total CER quality (Q_{jt}) in equation (6) is used to consider the first supposition and a positive correlation between the two is expected.

The second assumed interrelationship is emphasised most regarding the two here, because it involves an investigation of the relevance of a firm's environmental information that not only includes its environmental efficiency, but also the reporting quality as measured in this study. In this regard, an analytic method for an examination of the effect of firm environmental performance on its financial resources is devised. That is, a firm's financial resource as a dependent variable is modelled as a pooled OLS regression[40] of the form:

$$\begin{aligned} FIN\ PERF_{jt} = {} & \alpha + \beta_1(EMISSIONS_{jt-1}) + \beta_2(Q_{jt-1}) + \beta_3(GRI\ APP_{jt-1}) + \beta_4(INDEX_{jt-1}) + \beta_5(SIZE_{jt}) + \\ & \beta_6(INDManu_{jt}) + \beta_7(INDUtilities_{jt}) + \beta_8(INDTrade_{jt}) + \beta_9(INDTransport_{jt}) + \\ & \beta_{10}(INDFinance_{jt}) + \beta_{11}(INDRealEstate_{jt}) + \beta_{12}(INDOthers_{jt}) + \beta_{13}(COUNTRY_{jt}) + \\ & \beta_{14}(FIN\ PERF_{jt-1}) + \varepsilon_{jt} \end{aligned}$$

…… (16)

where j = 1,…, Nth firm; t = 2 and 3 (2006 and 2007, respectively), t-1 = 1 and 2 (2005 and 2006, respectively). The use of lagged explanatory variables takes into account the fact that business financial activities are based on environmental information from the previous period.

[40] The Breusch-Pagan Lagrange multiplier test for random effects after the random effects estimations accepted the null hypothesis that there are no random effects ($\overline{\chi}^2$ = 0.11, p = 0.3724) and therefore the pooled OLS estimation is employed. With this estimation, the cluster-robust standard errors option is employed to correct the errors for clustering on the individual.

In view of what has been elucidated above, the results and analyses from these empirical works are presented in the next chapter.

5 Results and Analyses

In chapter 4, three analytical methods for investigating the thesis' research issues were presented: first, a regression model was developed for an examination of the determinants of variation in CER quality, the second being concerned with the study of the disclosure behaviours to establish the level of support for institutional theory, and the third regression model was established to examine the environmental-financial performance interrelationship. This chapter deals with the outcome of the application of the research method and its results for each of these models.

The chapter is organised as follows. Section 5.1 considers the sample characteristics and the actual samples employed in each of the studies. A summary of the descriptive statistics for the measures of each qualitative characteristic pertaining to the analytical models in the subsequent sections is given in the next section, 5.2. Next, in section 5.3 the additional descriptive statistics, including those of the explanatory variables for the first regression model are disclosed as well as results and analysis being presented regarding the possible determinants of variation in CER quality. This is followed by consideration of the relevant descriptive statistics including the results and analysis of the second (tests of CER behaviours under institutional theory) and the third (the interrelation between financial and environmental performance) studies in sections 5.4 and 5.5, respectively. The chapter ends with a brief summary in section 5.6.

The STATA version 11 statistical software package was employed to undertake all of the analyses reported here.

5.1 Full and Restricted Sample

Applying the selection criteria described in the previous chapter (section 4.1) resulted in the identification of 181 companies in total (88 UK companies and 93 US companies), referred to as the full sample.[41] As three of these companies did not produce relevant reports for 2006 (because they were taken over in 2007) this gave rise to an unbalanced

[41] The names of the companies included in the sample and their business sectors are given in appendix 1.

panel dataset with 359 observations. Further, a subset of the full sample, referred to as the restricted sample, comprises observations for which GHG emissions data were available from the CDP, distributed as shown in table 5.1. That is, this sample excludes cases where the firm responded with incomplete data, responded but declined to disclose the requested data or did not respond to the request to participate in either CDP4 or CDP5, or both. The selected firms represent a wide range of industry sectors as classified by the ISIC Rev.3.1 (United Nations, 2002).

Table 5.1: Distribution of Observations in the Restricted Sample

	2005	2006	Total
UK	41	48	89
US	34	35	69
Total	**75**	**83**	**158**

With regards to the sample characteristics above, the restricted sample is used for the first regression model of determinants of variation in CER quality, whereas both the full and restricted samples are employed for the analysis of the second study, i.e. the test for institutional theory behaviours of CER. The third part of the analysis involves a sample that is restricted from the full sample, but differently from the restricted sample used in the first and second analyses, because a different set of dependent and independent variables are used in the regression model as well as the period covered being dissimilar.[42] The distinct descriptive statistics for each sample are presented towards the beginning of each of the three studies.

5.2 Qualitative Measure Results

Given all the complexities of the scoring system and the constraint in relation to the imposition of a balance between the four qualitative characteristics, as discussed in chapter 4, a standardised score out of 25 for each qualitative characteristic is employed for all the analyses in this study, rather than the raw score. That is, the $CERQ_{jt}$ score used from here on reflects the standardised figure.

[42] The details of companies included in this sample are also given in appendix 1.

5.2.1 Descriptive Statistics for the $CERQ_{jt}$

Table 5.2 presents a description of the dependent variables, i.e. the measures of each qualitative characteristic of CER, as well as the total quality, for the full sample. It can be seen that the mean total CER quality score is 30.4926, representing 30.49% of the maximum possible. This summary measure is highly influenced by the considerable numbers of non-disclosures across the range of sub-indicators for each component of quality. More specifically, the mean quality score per component is less than 10 out of 25, with the relevance characteristic having the least mean score (5.4780, as shown in table 5.2) that represents 21.91% of the maximum possible.[43] However, no firm in the sample made no disclosure at all and the imbalance between the four components of reporting quality therefore suggests that there is selective reporting on quality matters by firms. In this regard, one US firm in 2005 made no understandability disclosure. Moreover, the CER in 2005 and/or 2006 for 8 US firms had no relevance score, whereas that for 11 US firms appears to have been unreliable. Furthermore, a number of UK and US firms in 2005 and/or 2006 disclosed inconsistent and incomparable disclosures.

[43] This mean score for the relevance qualitative characteristic is significantly smaller than those of understandability, reliability and comparability and consistency, according to the Wilcoxon signed-rank tests at $p < 0.01$. This non-parametric test is used due to the non-normal distribution of the CER quality measures, a matter discussed below.

Table 5.2: Descriptive Statistics for the Measures of Each Qualitative Characteristic

$CERQ_{jt}$ and Q_{jt}	2005			2006			Total		
	UK[(b)]	US	Total	UK[(a), (b)]	US[(a)]	Total[(a)]	UK[(b), (c)]	US[(c)]	Total[(c)]
Understandability, U_{jt}									
Minimum	2.7752	0.0000	0.0000	6.0092	1.6055	1.6055	2.7752	0.0000	0.0000
Median	10.2408	8.6468	9.6101	10.4128	9.2431	9.7248	10.2638	8.9679	9.6330
Maximum	20.6422	13.4633	20.6422	17.3853	14.0596	17.3853	20.6422	14.0596	20.6422
Mean	10.3678***	8.1111	9.2083	10.4251***	8.8596***	9.6160**	10.3961***	8.4833***	9.4104***
Std. Dev.	1.8446	2.6965	2.5769	1.5512	2.5401	2.2557	1.7012	2.6396	2.4282
Observations	88	93	181	86	92	178	174	185	359
Relevance, $RELE_{jt}$									
Minimum	0.2375	0.0000	0.0000	0.2625	0.0000	0.0000	0.2375	0.0000	0.0000
Median	6.3547	2.5740	5.2464	7.3442	3.6220	6.1500	6.9500	3.2000	5.6357
Maximum	15.4143	13.9679	15.4143	14.1643	12.8750	14.1643	15.4143	13.9679	15.4143
Mean	6.7148***	3.5940	5.1113	7.5469***, ***	4.2655***	5.8509***	7.1260***, ***	3.9279***	5.4780***
Std. Dev.	3.5060	3.6085	3.8785	3.3404	3.6523	3.8627	3.4406	3.6360	3.8829
Observations	88	93	181	86	92	178	174	185	359
Reliability, $RELI_{jt}$									
Minimum	1.9231	0.0000	0.0000	0.9615	0.0000	0.0000	0.9615	0.0000	0.0000
Median	9.1346	3.8462	6.7308	10.5769	4.8077	6.7308	10.5769	4.8077	6.7308
Maximum	19.2308	14.4231	19.2308	18.2692	18.2692	18.2692	19.2308	18.2692	19.2308
Mean	9.7902***	4.6423	7.1451	10.2862***	5.1526*	7.6329**	10.0354***	4.8961	7.3870***
Std. Dev.	4.6368	3.5939	4.8631	4.6245	3.5625	4.8387	4.6240	3.5777	4.8504
Observations	88	93	181	86	92	178	174	185	359
Comparability and Consistency, C_{jt}									
Minimum	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Median	12.5000	0.0000	0.0000	12.5000	0.0000	12.5000	12.5000	0.0000	0.0000
Maximum	25.0000	25.0000	25.0000	25.0000	25.0000	25.0000	25.0000	25.0000	25.0000
Mean	9.3750***	5.2419	7.2514	12.3547***, ***	6.2500	9.1994***	10.8477***	5.7432	8.2173***
Std. Dev.	10.0734	7.2143	8.9408	9.6814	8.1832	9.4232	9.9656	7.7069	9.2221
Observations	88	93	181	86	92	178	174	185	359
Total CER Quality, Q_{jt}									
Minimum	7.3973	0.9865	0.9865	7.7457	1.9037	1.9037	7.3973	0.9865	0.9865
Median	33.4395	21.0632	28.2406	41.5908	24.1496	31.6247	36.7235	23.3554	29.6673
Maximum	63.4586	58.0004	63.4586	64.5207	61.0537	64.5207	64.5207	61.0537	64.5207
Mean	36.2477***	21.5893	28.7161	40.6129***, ***	24.5277***	32.2992***	38.4052***	23.0506	30.4926
Std. Dev.	13.8729	12.9226	15.2430	13.4749	13.2470	15.5689	13.8126	13.1322	15.4882
Observations	88	93	181	86	92	178	174	185	359

(a) $CERQ_{jt}$ mean significantly different from that of 2005 according to the Wilcoxon signed-rank test at the 10% level (*), at the 5% level (**) and at the 1% level (***).

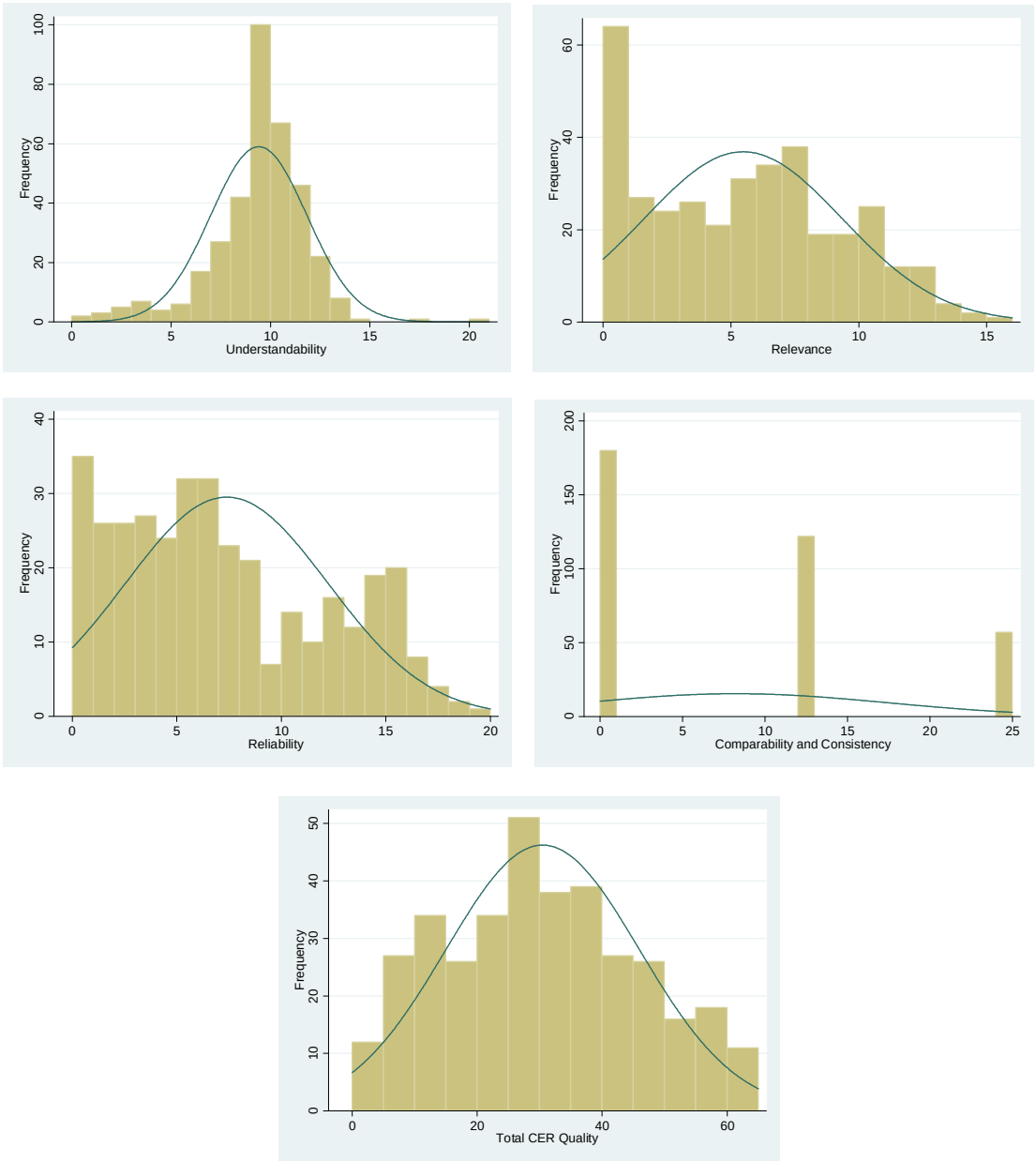
(b) $CERQ_{jt}$ mean significantly different from that of the US firms according to the Mann-Whitney test at the 10% level (*), at the 5% level (**) and at the 1% level (***).

(c) Mean significantly different from that of the other qualitative measures according to the Wilcoxon signed-rank test at the 10% level (*), at the 5% level (**) and at the 1% level (***). In this regard, there is no statistically significant difference between $RELI_{jt}$ and C_{jt} for the full sample. However, there is evidence that the distributions of the four types of qualitative characteristics are different according the Friedman test (Friedman's $\chi^2 = 156.0058$, $p = 0.0000$). With regards to the UK sample, U_{jt} and $RELI_{jt}$, U_{jt} and C_{jt} and $RELI_{jt}$ and C_{jt} are not significantly different, according to the Wilcoxon signed-rank test, whilst the Friedman test indicate a significant difference of the distributions of the four characteristics (Friedman's $\chi^2 = 74.8362$, $p = 0.0000$). Additionally, there is no significant difference between $RELE_{jt}$ and C_{jt} nor between $RELI_{jt}$ and C_{jt} for the US firms, according to the Wilcoxon signed-rank test, whereas the Friedman test results indicate a significant difference in the distributions of the four characteristics (Friedman's $\chi^2 = 123.8189$, $p = 0.0000$).

In consideration of the distribution of each qualitative characteristic and total quality, figure 5.1 depicts histograms of this and all can be seen as being asymmetrical and/or either leptokurtic or platykurtic. Moreover, every one of these measures has values of skew and/or kurtosis that indicate a statistically significant deviation from normal.[44] Further, the distribution of the comparability and consistency scores is not continuous owing to its ranked scoring pattern. With regards to the total CER quality, although its distribution is observed to be symmetrical, the degree to which the scores cluster in the tails of the distribution appears to be relatively great, suggesting a platykurtic distribution and this is borne out by there being a significant deviation from normal. Nevertheless, with the exception of the comparability and consistency graph, the symmetrical distribution for all of the others suggests that the measures of each qualitative characteristic and the total quality have a degree of discrimination across firms. In sum, the measures of CER quality are not normally-distributed, thus non-parametric techniques to examine the differences in the total CER quality and each qualitative characteristic score are employed from here on.

[44] Indicated by the Skewness/Kurtosis tests for normality at $p < 0.01$.

Figure 5.1: Frequency Distribution Showing the Number of Observations in the Two-Year Period from 2005 to 2006 by Measures of Each Qualitative Characteristic



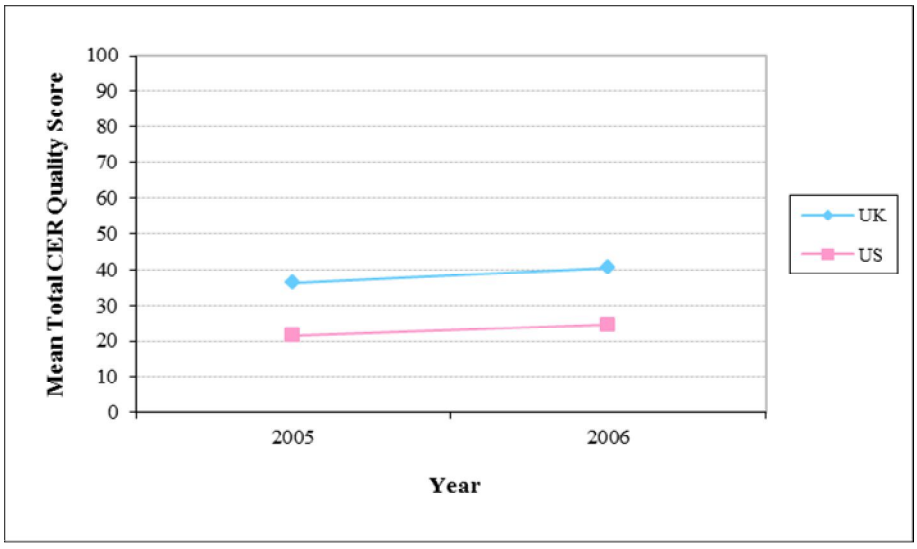
With regards to the differences between the reporting quality scores over the two-year period, the descriptive statistics in table 5.2 reveal that, generally, the four characteristic scores and total quality scores in 2006 are statistically significantly higher than those for 2005. In relation to this, it is observed that the total reporting quality of both the UK and the US statistically significantly increases from 2005 to 2006. However, the outcomes for the qualitative components of the two countries vary, except for the relevance scores which both increased significantly. Consequently, it can be surmised that the relevance scores between the two years, in both countries contributed to this higher level of total

reporting quality and this observation perhaps reflects the reporting reaction to the launch of the latest GRI Guidelines (GRI, 2006b) prior to the commencement of this study, in 2006.

Turning to the differences between the CER quality across the two countries, as shown in table 5.2, the statistically significant greater scores (for the four qualitative components and total quality) for the UK in both 2005 and 2006 indicate that these firms consistently reported a better quality of environmental information than those in the US. This finding reflects that a principles-based financial accounting system may enhance higher quality environmental disclosures than a rules-based one and this is inconsistent with the previous comparative studies elicited from rules- vs. principles-based financial reporting (e.g. Beattie and Jones, 1997; Beattie and McInnes, 2006).

In relation to the findings above, figure 5.2 depicts the annual average total quality score for environmental reporting for the sample countries from 2005 to 2006.

Figure 5.2: The Mean Total CER Quality Score for the UK and US Sample Countries: 2005 – 2006



As indicated in table 5.2, the mean understandability score is significantly higher than that of the other qualitative scores, whereas the mean relevance score is significantly lower. Nevertheless, when across country information is taken into account, it emerges that the mean relevance score is significantly smaller than that of the other scores in the UK, whilst the mean scores of all of the latter characteristics are not statistically significantly different. Moreover, the mean understandability score is significantly

greater than that of the other scores in the US, whereas there are no significant differences between the mean scores of the remaining components, with the exception of the significantly higher mean of reliability than that of relevance. These findings suggest that the sample firms, particularly in the UK, paid the least attention to reporting relevance and this may reflect the voluntary practices in environmental information disclosures, where there is an absence of uniform reporting guidelines. In addition, the firms, especially those in the US, saw understandability as being the most important characteristic for their environmental information disclosures. This preference is rather surprising, for given the rules-based accounting system it was expected that comparability and consistency would register as more important than the other components, because it was assumed that the reporting would reflect the minimalist style of financial reporting and hence engender this characteristic across firms. In sum, it would appear that the CER quality in the two focal countries is unbalanced in practice.

However, despite the above findings from the Spearman correlation matrix in table 5.3, it is observed that the comparability and consistency characteristic contributes significantly more to disclosure quality than the other components. This outcome being inconsistent with the previous result can be explained by the fact that the four qualitative characteristics are highly correlated with each other and their underlying relationships affect their contribution to total quality. However, the mean understandability score (9.4104, as shown in table 5.2) represents 37.64% of the maximum possible, compared to 30.49% across the universal set, which represents the highest score when compared to that of the other components[45] and this provides further support for the above finding that this makes the greatest contribution to overall quality. In general, table 5.3 reveals that the total CER quality is positively strongly correlated with the underlying measures of each qualitative characteristic, with all squared values greater than 25, thus giving support to *H1.1* and *H1.2*. In addition, the different degrees of positive correlation with total CER quality and the imperfect correlations with each other of the four components provide further evidence that there is discrimination across firms for each of the four characteristics in their environmental reporting.

[45] The mean relevance, reliability and comparability and consistency scores represent 21.91%, 29.55% and 32.87%, respectively, of the maximum possible.

Table 5.3: Spearman Correlation Matrix

		i	ii	iii	iv	v
i	Understandability, U_{jt}	1.0000				
ii	Relevance, $RELE_{jt}$	0.3853***	1.0000			
iii	Reliability, $RELI_{jt}$	0.3859***	0.7994***	1.0000		
iv	Comparability and Consistency, C_{jt}	0.2803***	0.3943***	0.2869***	1.0000	
v	Total CER Quality, Q_{jt}	0.5127***	0.7932***	0.7472***	0.8128***	1.0000

*** denotes significant at the 1% level

The issue of comprehending the variation within and between the CER quality measures is addressed through the three studies introduced in chapter 4. That is, each empirical section is geared to testing the hypotheses set out in chapter 3 through several different processes based on the outcomes in relation to the four components and total CER quality measures of disclosure elicited above.

5.3 Determinants of Variation in CER Quality

5.3.1 Summary of the Descriptive Statistics

Table 5.4 presents a summary of the descriptive statistics for the dependent and explanatory variables in relation to the regression of measures of the CER quality on the plausible determinants for the restricted sample, as described above.

The distribution of the CER quality measures of the restricted sample is generally similar to that of the full sample shown in the previous section. With regards to this, however, Panel A of the table 5.4 shows that the restricted sample mean CER quality scores for the four components and the total CER quality are slightly higher than those of the full sample.

Table 5.4: Summary of the Descriptive Statistics for the Dependent and Explanatory Variables

	Country/Accounting System, $COUNTRY_{jt}$		
	UK (= 1)	US (= 0)	**Total**
Panel A: Dependent Variables			
Understandability, U_{jt}			
Minimum	7.1330	4.9083	4.9083
Median	10.4358	9.3349	9.8509
Maximum	17.3853	13.4633	17.3853
Mean	10.6505	9.2915	10.0570
Std. Dev.	1.3674	1.5677	1.6030
Observations	89	69	158
Relevance, $RELE_{jt}$			
Minimum	0.7881	0.0000	0.0000
Median	8.8893	7.1940	7.5482
Maximum	15.4143	13.9679	15.4143
Mean	8.6759	7.1003	7.9878
Std. Dev.	3.0179	2.8684	3.0468
Observations	89	69	158
Reliability, $RELI_{jt}$			
Minimum	2.8846	0.0000	0.0000
Median	13.4615	6.7308	10.5769
Maximum	18.2692	18.2692	18.2692
Mean	12.4352	7.7341	10.3822
Std. Dev.	3.4480	3.4881	4.1719
Observations	89	69	158
Comparability and Consistency, C_{jt}			
Minimum	0.0000	0.0000	0.0000
Median	12.5000	12.5000	12.5000
Maximum	25.0000	25.0000	25.0000
Mean	11.7978	8.8768	10.5222
Std. Dev.	10.2108	8.6021	9.6229
Observations	89	69	158
Total CER Quality, Q_{jt}			
Minimum	17.3195	7.7982	7.7982
Median	43.5477	33.2236	37.2460
Maximum	64.5207	61.0537	64.5207
Mean	43.5593	33.0028	38.9492
Std. Dev.	12.4970	11.0235	12.9521
Observations	89	69	158
Panel B: Categorical Explanatory Variables			
Industry Sector, $INDUSTRY10_{jt}$			
1 = Mining, $INDMining_{jt}$	14	8	22
2 = Manufacturing, $INDManu_{jt}$	27	50	77
3 = Utilities, $INDUtilities_{jt}$	11	0	11
5 = Trade, $INDTrade_{jt}$	10	0	10
7 = Transport, $INDTransport_{jt}$	6	4	10
8 = Finance, $INDFinance_{jt}$	9	2	11
9 = Real Estate, $INDRealEstate_{jt}$	10	4	14
10 = Other Service Activities, $INDOthers_{jt}$	2	1	3
Total Observations	89	69	158
Fisher's exact $p = 0.000$			
Cross-Listing of Shares, $CROSS\ LISTING_{jt}$			
1 = Other Country(ies) Shares Listed	58	26	84
0 = No Other Country(ies) Shares Listed	31	43	74
Total Observations	89	69	158
$\chi^2 = 11.7937$, $p = 0.001$			
GRI Guidelines Application, $GRI\ APP_{jt}$			

Table 5.4: Summary of the Descriptive Statistics for the Dependent and Explanatory Variables (continued)

	Country/Accounting System, $COUNTRY_{jt}$		
	UK (= 1)	US (= 0)	**Total**
1 = GRI Guidelines Application	41	39	80
0 = Non-GRI Guidelines Application	48	30	78
Total Observations	89	69	158
$\chi^2 = 1.6994$, $p = 0.192$			
Independent Environmental Ratings, $INDEX_{jt}$			
1 = FTSE4Good/DJSI US Listed	73	45	118
0 = FTSE4Good/DJSI US Non-Listed	16	24	40
Total Observations	89	69	158
$\chi^2 = 5.8054$, $p = 0.016$			
Year, $YEAR_{jt}$			
1 = 2005	48	35	83
2 = 2006	41	34	75
Total Observations	89	69	158
$\chi^2 = 0.1604$, $p = 0.689$			
Panel C: Continuous Explanatory Variables			
Organisational Size, $SIZE_{jt}$ (By Natural Logarithm of Total Assets)			
Minimum	20.7372	23.1398	20.7372
Median	23.8172	24.4918	24.1115
Maximum	28.2520	28.2646	28.2646
Mean	23.9845	24.6286	24.2658
Std. Dev.	1.2970	1.0645	1.2395
Observations	89	69	158
ANOVA, F = 11.17, $p = 0.0010$			
Proportion of Sales Revenue outside a Firm's Home Region, $SALES\ OUTS_{jt}$			
Minimum	0.0000	0.2747	0.0000
Median	46.6883	47.2638	47.1282
Maximum	100.0000	94.2323	100.0000
Mean	38.8610	51.3274	44.3052
Std. Dev.	30.1102	18.0371	26.2213
Observations	89	69	158
ANOVA, F = 9.25, $p = 0.0028$			
Financial Performance, $FIN\ PERF_{jt}$			
Minimum	-17.3900	6.7300	-17.3900
Median	25.3400	33.8800	31.8650
Maximum	659.5000	113.8600	659.5000
Mean	45.4751	33.7420	40.3512
Std. Dev.	88.1485	16.2933	67.1142
Observations	89	69	158
ANOVA, F = 1.19, $p = 0.2771$			
Environmental Performance, $EMISSIONS_{jt}$			
Minimum	0.2919	-1.1132	-1.1132
Median	4.1038	4.3466	4.2271
Maximum	10.3903	7.6959	10.3903
Mean	4.8007	4.5147	4.6758
Std. Dev.	2.3550	1.4864	2.0214
Observations	89	69	158
ANOVA, F = 0.78, $p = 0.3795$			

Pearson Correlation Coefficient

	$SIZE_{jt}$	$SALES\ OUTS_{jt}$	$FIN\ PERF_{jt}$	$EMISSIONS_{jt}$
$SIZE_{jt}$	1.0000			
$SALES\ OUTS_{jt}$	0.0697	1.0000		
$FIN\ PERF_{jt}$	-0.1261	-0.1503*	1.0000	
$EMISSIONS_{jt}$	-0.0520	0.2754**	-0.0927	1.0000

* denotes significant at the 10% level. ** denotes significant at the 5% level.

Regarding the categorical explanatory variables in Panel B it can be seen that $GRI\ APP_{jt}$ and $YEAR_{jt}$ are proportionately distributed between country of domicile/accounting system ($COUNTRY_{jt}$). In addition, the results for the continuous explanatory variables in Panel C show that there is no significant difference in the mean values of $FIN\ PERF_{jt}$ and $EMISSIONS_{jt}$, thus implying that they are similar across the sample countries at approximately 40% of total equity and 4.7 tonnes of CO_2-equivalent per one million USD operating revenue, respectively. However, when two or more categorical variables are applied in the regression it is likely that multicollinearity will be found. In this regard, the classification of categorical variables in Panel B, apart from the two aforementioned, demonstrates that a greater proportion of the UK companies than those in the US are cross-listed in other countries and more are listed in an independent ratings index. Moreover, in relation to the continuous explanatory variables in Panel C, $SIZE_{jt}$ and $SALES\ OUTS_{jt}$ are significantly higher, at the 1% level, in the US companies. However, when the potential impact of these relationships is considered in the context of the regression results it will be seen that their impact is trivial. With regards to the $SALES\ OUTS_{jt}$, the average values for this of the sample countries are 38.8610 among the UK firms and 51.3274 among the US ones. The former figure is greater than that for the 25th percentile and the latter is more than the 50th percentile value, which suggests that about 75% and 50% of firms in the UK and the US, respectively, have a high proportion of sales revenue outside their own region.

The Pearson correlation results in Panel C indicate that $SALES\ OUTS_{jt}$ and $EMISSIONS_{jt}$ are positively correlated at the 5% level with a coefficient value of 0.2754. This significantly positive correlation suggests that a firm with a high proportion of sales revenue outside its home region tends to cause high environmental impact in terms of its greenhouse gases (GHGs) emissions, thus again there is multicollinearity. Owing to the presence of multicollinearity for several of the explanatory variables, some auxiliary regressions are performed in order to establish the robustness of the parameter estimates. The results consistently reveal a strong pattern of statistical significance and the coefficient estimates appear to be constant from using this procedure. In addition, the cluster-robust standard errors option is employed in the random-effects GLS regression to control for equicorrelated errors in relation to individual firms. Hence, it is believed that multicollinearity can be considered immaterial in the analysis.

Table 5.5 provides the Spearman correlation matrix for the different types of environmental reporting quality and the continuous independent variables.

Table 5.5: Spearman Correlation

	U_{jt}	$RELE_{jt}$	$RELI_{jt}$	C_{jt}	Q_{jt}
U_{jt}	1.0000				
$RELE_{jt}$	0.0604	1.0000			
$RELI_{jt}$	0.1838**	0.4269***	1.0000		
C_{jt}	0.2431***	0.3197***	0.0594	1.0000	
Q_{jt}	0.3616***	0.6109***	0.4778***	0.8714***	1.0000
$SIZE_{jt}$ [(a)]	-0.0936	0.0071	0.0759	-0.0491	-0.0146
$SALES\ OUTS_{jt}$	-0.3059***	-0.1090	-0.0255	-0.1196	-0.1623**
$FIN\ PERF_{jt}$	-0.1351*	0.1532*	0.1015	0.0958	0.1195
$EMISSIONS_{jt}$	-0.2992***	0.1580**	0.1742**	-0.1350*	-0.0600

* denotes significant at the 10% level. ** denotes significant at the 5% level. *** denotes significant at the 1% level.
(a) By natural logarithm of total assets

The matrix shows that the scores of understandability and relevance are not statistically significantly correlated, which is inconsistent with the previous findings for the full sample. Further investigation of this non-correlation is carried out in the context of their components and it is found that the readability score (U_1) and colour presentation in text ($U_{6.1}$) of the environmental disclosures are not significantly correlated with those of the relevance scores, as shown in the Spearman correlation results in appendix 4. However, significantly positive relationships between the two understandability components and those of the relevance scores are found when the relationships are investigated for the full sample. Thus, it emerges that the readability scores and colour representation in text are not related to the relevance of reporting of firms in the restricted sample, but they are for the full sample.

Moreover, the relationship between reliability and comparability and consistency is also not statistically significant in the restricted sample. In relation to this, the correlation of the components of these two qualitative characteristics is also examined. The findings reveal that the reliability components with regards to an external verification ($RELI_{1.1}$) and its statement ($RELI_{2.1}$, $RELI_{2.3}$, $RELI_{2.4}$ and $RELI_{2.6}$) are not significantly correlated with comparability and consistency. Consequently, it seems reasonable to suggest that

having an external verification does not enhance comparability and consistency of the disclosures and is thus unnecessary. Nevertheless, the correlation outcome for the components of these two characteristics for the full sample show that the components of reliability significantly positively correlate with comparability and consistency, except for $RELI_{2.4}$ and $RELI_{2.6}$, which refer to review of progress against a firm's policy and targets in the verification statement, respectively. Therefore, the inessentiality of an external verification can only be assumed for the restricted sample and not for the full one.

The matrix in table 5.5 also shows that $SIZE_{jt}$ is not significantly correlated with any of the measures of CER quality as well as total quality, thus suggesting that a firm's size does not influence the quality of the disclosure.[46] Additionally, $SALES\ OUTS_{jt}$ is significantly negatively correlated with understandability and total reporting quality (at the 1% and 5% level, respectively) and this seems to be inconsistent with the stakeholder theory, but in tune with the distracting attention facet of the legitimacy theory, where it is purported that a firm with a high extent of global operation tends to restrict its reporting quality so as to protect its interests. Moreover, $FIN\ PERF_{jt}$ is significantly negatively correlated with understandability, whereas it is positively correlated with relevance, both of these at the 10% level, possibly indicating that a firm with high retained earnings and profits tends to publish a less understandable, but more relevant, environmental report. Furthermore, whilst $EMISSIONS_{jt}$ is significantly negatively correlated with understandability and comparability and consistency (at the 1% and 10% levels, respectively), it is positively correlated with relevance and reliability (at the 5% level). With regards to this, this augurs that a firm with poor environmental performance is more likely to hide it through its non-understandable, non-comparable and inconsistent environmental reporting, whilst still appearing to provide relevant and reliable information.

5.3.2 Regression Results and Analysis

[46] However, $SIZE_{jt}$ is significantly positively correlated with the reliability score (at the 5% level) when a Pearson correlation is conducted, suggesting that a larger firm is more concerned on reporting reliability than a smaller one.

For the panel form of the samples, as previously discussed, pooled tobit, random-effects tobit and pooled OLS estimations are not appropriate for this first model.[47] Moreover, the null hypothesis for the Hausman test that the random effects (RE) estimator is consistent holds and therefore generalised least squares (GLS) with this estimator is chosen in preference to using the fixed effects (FE) estimator. That is, this researcher has decided to report and analyse only the results of the random-effects model.[48] Table 5.6 presents the results of the regressions, i.e. equation (6), as shown in chapter 4, of the measures of each qualitative characteristic: understandability, relevance, reliability and comparability and consistency and the overall/total CER quality. Column a and b of the results for each measure and the total quality provide comparative results between the uses of the natural logarithm of a firm's total assets and the natural logarithm of firm market capitalisation, respectively, as proxies for firm size. However, since the researcher is aware that the normalised outcome of the comparability and consistency score is ordinal, nonlinear pooled ordered logistic regression is instead performed for this component[49] and the results in table 5.6 for this qualitative characteristic are derived from this estimation.

The linear effects of the expected salient factors on total CER quality will be discussed first. The effects of the explanatory factors on each component of the reporting quality will then be sequentially analysed. Further, similar analysis is conducted for each of the two years using OLS regressions (and ordered logistic regression for comparability and consistency) and the results, as shown in appendix 6, are similar to those below.

[47] The Breusch-Pagan Lagrange multiplier tests for heteroskedasticity after the pooled OLS model and for random effects after the random effects model demonstrated that the pooled OLS estimation is not appropriate.

[48] The results of the pooled tobit, RE tobit, and pooled OLS estimations are shown in appendix 5.

[49] As discussed in chapter 4, the pooled ordered logistic regression is conducted using the 'ologit' command with the 'vce(cluster id)' option to correct for error correlation over time, for a given individual in STATA version 11. This model, rather than the random-effects or other more efficient ones, is employed for the C_{jt} data, because of an absence of results from the random-effects ordered logistic estimation and unavailability of a population-averaged (PA) estimator for the ordered logistic model.

Table 5.6: Regression Results by Measure

Explanatory Variables	Predicted Sign	Dependent Variables									
		Total CER Quality, Q_{jt}		Understandability, U_{jt}		Relevance, $RELE_{jt}$		Reliability, $RELI_{jt}$		Comparability and Consistency, C_{jt}[b]	
		a	**b**	**a**	**b**	**a**	**b**	**a**	**b**	**a**	**b**
Constant		-7.5365	-8.9985	7.1600**	10.0665**	-1.6780	2.9071	-16.7158*	-13.6284		
		(-0.27)	(-0.28)	(1.98)	(2.48)	(-0.23)	(0.34)	(-1.65)	(-1.41)		
$SIZE_{jt}$[a]	+	2.1218*	2.1940*	0.1283	0.0015	0.3624	0.1715	1.0851***	0.9678**	0.0395	0.0940
		(1.94)	(1.70)	(0.88)	(0.01)	(1.24)	(0.50)	(2.67)	(2.45)	(0.22)	(0.40)
$INDUSTRY10_{jt}$											
$INDManu_{jt}$	±	-12.8044***	-12.9238***	-0.3561	-0.3866	-1.1999	-1.2729	-2.0730	-2.3409**	-2.2797***	-2.2402***
		(-2.91)	(-2.99)	(-0.82)	(-0.93)	(-1.19)	(-1.34)	(-1.61)	(-1.99)	(-2.67)	(-2.60)
$INDUtilities_{jt}$	±	-11.3636**	-9.6421*	-0.2514	-0.1606	-2.2367	-2.4804	-1.0279	-0.7628	-1.7256	-1.4132
		(-2.09)	(-1.66)	(-0.50)	(-0.28)	(-1.50)	(-1.53)	(-0.86)	(-0.68)	(-1.56)	(-1.26)
$INDTrade_{jt}$	-	2.4187	2.3152	0.7512	0.7543	-0.6747	-0.3142	-3.4869*	-4.6611***	15.9812***	14.7871***
		(0.51)	(0.47)	(1.28)	(1.14)	(-0.60)	(-0.26)	(-1.89)	(-2.82)	(13.83)	(12.32)
$INDTransport_{jt}$	±	-8.8371*	-7.9766	-0.7756	-0.6699	-2.8073***	-2.4728**	-1.8127	-1.5654	-0.5496	-0.6006
		(-1.68)	(-1.51)	(-1.24)	(-1.03)	(-2.79)	(-2.43)	(-0.98)	(-0.81)	(-0.48)	(-0.53)
$INDFinance_{jt}$	-	-24.7079***	-19.4299***	-0.5852	-0.1865	-3.4304***	-2.5274**	-2.3282	0.0987	-4.1056***	-3.9743***
		(-4.38)	(-3.63)	(-0.87)	(-0.29)	(-2.96)	(-2.19)	(-0.98)	(0.05)	(-2.80)	(-2.79)
$INDRealEstate_{jt}$	-	-15.0154***	-14.2368**	0.2202	0.2605	-1.7535	-1.6235	-2.9135	-2.9011	-2.3850**	-2.3391**
		(-2.70)	(-2.43)	(0.28)	(0.33)	(-1.07)	(-0.96)	(-1.62)	(-1.56)	(-2.27)	(-2.19)
$INDOthers_{jt}$	-	-17.1878***	-16.4162***	1.5682**	1.5896**	-6.1620***	-6.0579***	-1.7406	-1.8106	-1.6480	-1.6719
		(-2.78)	(-2.68)	(2.35)	(2.37)	(-3.33)	(-3.20)	(-0.95)	(-1.02)	(-1.35)	(-1.35)
$COUNTRY_{jt}$	+	9.3816***	9.7463***	1.0889***	1.0015***	1.4477**	1.3082*	5.5238***	5.8312***	0.2623	0.2297
		(3.69)	(3.35)	(4.08)	(3.54)	(2.06)	(1.78)	(8.73)	(8.54)	(0.52)	(0.39)
$CROSS\ LISTING_{jt}$	+	1.6708	2.2542	0.3633	0.3712	-0.1153	-0.0227	-0.7022	-0.6639	0.4758	0.5758
		(0.82)	(1.03)	(1.30)	(1.32)	(-0.22)	(-0.04)	(-1.06)	(-1.03)	(1.06)	(1.23)
$SALES\ OUTS_{jt}$	+	-0.0438	-0.0593	-0.0090	-0.0091	-0.0339***	-0.0305***	-0.0101	-0.0205	0.0033	0.0020
		(-0.93)	(-1.14)	(-1.33)	(-1.29)	(-3.31)	(-2.90)	(-0.66)	(-1.25)	(0.34)	(0.20)
$FIN\ PERF_{jt}$	+	0.0342***	0.0294**	-0.0006	-0.0007	0.0096**	0.0091**	0.0012	-0.0010	0.0125*	0.0112*
		(2.94)	(2.54)	(-0.49)	(-0.62)	(2.14)	(1.99)	(0.39)	(-0.36)	(1.95)	(1.95)
$EMISSIONS_{jt}$	-	-1.7945***	-1.7011***	-0.2040**	-0.1824**	0.1828	0.1625	0.0958	0.1263	-0.4731***	-0.4583***
		(-3.01)	(-2.74)	(-2.46)	(-2.16)	(1.17)	(1.02)	(0.42)	(0.55)	(-3.15)	(-3.01)
$GRI\ APP_{jt}$	+	3.8407**	3.1470	0.2196	0.3205	1.2101**	1.3120**	0.7661	0.7183	0.7154	0.5457
		(2.00)	(1.64)	(0.79)	(1.05)	(2.09)	(2.06)	(1.33)	(1.18)	(1.62)	(1.21)
$INDEX_{jt}$	+	2.1990	1.7950	-0.0537	0.0243	0.6162	0.5269	-0.3959	-0.2519	0.3068	0.2239
		(0.81)	(0.63)	(-0.18)	(0.08)	(1.20)	(1.03)	(-0.60)	(-0.37)	(0.56)	(0.41)
$YEAR_{jt}$	+	3.1913**	2.9387**	0.3171	0.2995	0.4665*	0.4519	-0.1526	-0.3134	0.7358**	0.7219**
		(2.52)	(2.22)	(1.61)	(1.45)	(1.74)	(1.56)	(-0.47)	(-0.93)	(2.32)	(2.24)
R^2		0.459	0.444	0.372	0.373	0.329	0.325	0.493	0.506		
Adjusted R^2		0.402	0.385	0.305	0.307	0.258	0.254	0.439	0.454		
Pseudo R^2:											
McFadden's Adjusted R^2										0.112	0.095
Nagelkerke R^2										0.433	0.412
Log pseudolikelihood										-131.3292	-128.1825
Wald χ^2		318.27	312.78	122.29	133.83	95.31	97.30	178.09	247.90	1314.34	1041.71
Prob > χ^2		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Number of Observations		158	152	158	152	158	152	158	152	158	152

The *z*-statistics are the *z*-values adjusted for heteroskedasticity consistent standard errors.
* denotes significant at the 10% level. ** denotes significant at the 5% level. *** denotes significant at the 1% level.
(a) Column **a** and **b** depict the models using the natural logarithm of total assets and market capitalisation, respectively, as a firm size proxy.
(b) The results for comparability and consistency are derived from the pooled ordered logistic regression, due to the fact that the C_{jt} is ordinal. In this regard, the model is estimated using the 'ologit' command with the 'vce(cluster id)' option to correct for error correlation over time for a given individual in STATA version 11. The exact threshold value for the pooled ordered logistic regression is not provided by the estimation and hence not reported.

Determinants of Total CER Quality

Size (as measured by the natural logarithms of firm total assets and firm market capitalisation) has a weakly positive effect on the tendency to provide reporting quality. In addition, there is significant systematic cross-sector variation in qualitative disclosure behaviour, with firms in the finance, other service activities, real estate, manufacturing, utilities and transport[50] sectors being significantly less likely, in this order, to produce high quality reports than firms in the comparator sector (mining). That is, the finance sector is least likely to disclose high quality and although the transport sector is found to be associated with less quality disclosure than the mining sector, its disclosure quality is closer to the latter than all other industrial types. This pattern is generally consistent with existing evidence of environmental disclosure variations across industry sectors in terms of their environmental impact and degrees of prominence for stakeholder groups.

Moreover, the country characteristic (country of domicile) is found to be a highly significant determinant of the quality of environmental reporting, in that firms domiciled in the UK tend to produce higher quality disclosures than those domiciled in the US. Further, this provides evidence that the financial accounting systems powerfully shape the quality of environmental disclosure, with UK firms that use principles-based reporting system producing more quality than the US firms that apply a rules-based system. However, the other two firm characteristics relating to country that indicate the extent of environmental concerns and exposures, namely, cross-listing of shares and proportion of sales revenue outside a firm's home region, appear to be immaterial.

Furthermore, profitability (as measured by return on shareholder funds or ROE) has a significantly positive effect on the tendency to make better quality disclosures. This result supports the arguments proposed by Brammer and Pavelin (2006a, 2006b) and Cormier and Magnan (1999) that firms with financial resources availability should be able to support the cost of preparation and provision of their environmental disclosures.

[50] Whilst this is weakly significant for firms in the transport sector if the natural logarithm of firm total assets is used as a proxy for size in the model, this fails to reach statistical significance ($p = 0.131$) if the natural logarithm of firm market capitalisation is employed as this proxy. Under this approach, from least to most, firms in the utilities, manufacturing, real estate, other service activities and finance sectors are significantly less likely to produce high quality reports than firms in the comparator sector (mining).

In addition, environmental performance is also found to be highly influential on reporting quality, with the level of GHGs emissions negatively shaping the quality of environmental disclosures. That is, firms with poorer environmental performance (higher GHGs emissions) tend to report less quality. This result supports prior studies (e.g. Al-Tuwaijri et al., 2004; Clarkson et al., 2008) and is consistent with a proactive legitimating strategy based on legitimacy theory, whereby firms with good environmental performance tend to produce more extensive environmental disclosures, whilst those with poor performance provide less information. Nevertheless, the result appears to contrast with previous work of Brammer and Pavelin (2006a, 2006b), Hughes et al. (2001) and Patten (2002a), who found negative associations between environmental performance and disclosure and suggested that firms with a record of poor environmental performance appear to realise their stakeholder exposure, hence they tend to disclose their environmental performance and offer more environmental information to avoid reputation destruction as well as to secure their legitimacy position.

Additionally, GRI Guidelines application is also found to be a significant determinant of whether an environmental report is proficiently produced.[51] However, the independent environmental ratings component/variable (as measured by membership listing in the home country's sustainability index: FTSE4Good UK and DJSI United States Index), whilst being positively related with quality of environmental disclosure, fails to reach statistical significance. Lastly, reporting year is seen to have some explanatory power in that there is a significant positive effect on reporting quality.

In sum, subject to the above qualifications, in terms of the total quality of environmental reporting, there is evidence to support hypotheses *H2 – H4.1*, *H5 – H8* and *H10* but not *H4.2*, *H4.3* and *H9*.

[51] Only in the model that uses the natural logarithm of firm total assets as a proxy for size for when the natural logarithm of market capitalisation is employed as this proxy, GRI Guidelines application appears to be immaterial.

Determinants of CER Understandability

A few common findings arise from the analysis of the total reporting quality and information understandability. For instance, as with total quality, the country characteristic strongly shapes the understandability of the environmental disclosure, whereby firms domiciled in the UK using a principles-based financial accounting system tend to produce higher understandability disclosures than those domiciled in the US under a rules-based system. Additionally, the other two firm characteristics relating to country (cross-listing of shares and the proportion of sales revenue outside a firm's home region) also appear to be irrelevant to reporting understandability. Moreover, high GHGs emissions, signifying poor environmental performance, also have a negative effect on CER understandability and this implies the presence of a legitimisation effect. That is, this negative effect indicates that poor performers tend, strategically, to offer less reporting understandability to the public than good ones. Furthermore, independent environmental ratings, again as with total quality, fail to reach statistical significance.

However, there are some remarkable dissimilarities between the results for total reporting quality and disclosure understandability. In particular, size, whilst being positively related[52], fails to reach statistical significance and firms in the other service activities sector are significantly more likely to disclose understandable environmental reports than those in mining. However, apart from this there is no significant variation in CER understandability across the rest of the industry sectors. In general, this result of disclosure understandability is in contrast to prior evidence suggesting that there is a positive correlation between disclosure and a sector's environmental sensitivity. In addition, there is no association between disclosure understandability and both profitability and GRI Guidelines application. Moreover, reporting year has no effect on reporting understandability.

In sum, in relation to understandability of environmental disclosure there is evidence to support hypotheses *H4.1*, *H6* and *H7* but not *H2*, *H3*, *H4.2*, *H4.3*, *H5*, *H8*, *H9* and *H10*.

[52] With the uses of both the natural logarithms of firm total assets and of firm market capitalisation as a proxy for size.

Determinants of CER Relevance

The results show some similarities between those for the total reporting quality and disclosure relevance. In particular, the country characteristic of where a firm is domiciled also powerfully influences the relevance of CER[53], whereby those in the UK under a principles-based accounting system are more likely to present more relevant environmental reporting than those in the US using a rules-based system. However, one of the other firm characteristics relating to country, that of cross-listing of shares, also appears to have no effect on reporting relevance. In addition, as with the results for total reporting quality, profitability (as measured by return on shareholder funds or ROE) exerts a significant positive effect on the relevance of the disclosures, thus supporting Brammer and Pavelin (2006a, 2006b) and Cormier and Magnan's (1999) arguments regarding financial resource availability, as discussed above.

Moreover, GRI Guidelines application, unlike for the other characteristics, is found to be significantly influential on the relevance of firms' environmental disclosures. This is perhaps to be expected, because the Guidelines have been developed as a worldwide conceptual framework for non-financial social and environmental reporting content and the key performance indicators in them broadly frame social and environmental issues a firm in any industry sector should address in its CER. Therefore, those using the Guidelines, which are widely considered the most comprehensive available at the global level, are more likely to disclose relevant information than their counterparts. Additionally, the independent environmental ratings variable is not statistically significant regarding disclosure relevance. Furthermore, reporting year is seen to have weakly positive effect on relevance.[54]

However, there are some differences between the regression results for total reporting quality and the relevance component. In this regard, firm size, as measured by both the natural logarithms of total assets and market capitalisation, has no significant link to the

[53] If the natural logarithm of market capitalisation is used as a proxy for firm size, the country of domicile and hence, accounting system, has a weakly positive effect on reporting relevance ($p = 0.075$).

[54] This finding is only found in the case when the natural logarithm of total assets is used as a proxy for firm size and when that for market capitalisation is employed as this proxy, year of reporting fails to reach statistical significance.

disclosure relevance. Moreover, cross-sector variation, as well, appears to be present in an ordered pattern that is consistent with prior studies in terms of sectoral environmental sensitivity, but relatively few industry sectors have significant effects, when compared to those for the total reporting quality. That is, ranging from most to least, only firms in the other service activities, finance and transport sectors are significantly less likely to make relevant environmental reporting than firms in the mining sector.

Additionally, unlike with total reporting quality, the proportion of sales revenue outside a firm's home region, one of the firm characteristics relating to country, is strongly found to be a significant function of environmental reporting relevance. That is, it emerges that the proportion of sales revenue outside a firm's home region, is negatively related with the relevance of environmental disclosure. This indicates that a firm with more environmental visibility owing to the extent of its international operations and hence, having more stakeholders based outside its home region, is more likely to make irrelevant environmental disclosure than it would do otherwise. This finding is inconsistent with one perspective under the stakeholder and legitimacy theories, where it is purported that a firm will disclose more as a legitimising effort in response to an increase in stakeholder visibility. Therefore, the outcome here supports the opposite view that firms employ a distracting attention strategy in terms of disclosure relevance when they are more widely exposed to stakeholders. Moreover, contrasting with the strongly negative influence on total reporting quality (and disclosure understandability), GHGs emissions appear to be immaterial in relation to disclosure relevance.

In sum, for environmental reporting relevance, the findings support hypotheses *H3*, *H4.1*, *H5*, *H7*, *H8* and *H10*, but not *H2*, *H4.2*, *H4.3*, *H6* and *H9*.

Determinants of CER Reliability

Size (as measured by both natural logarithms of firm total assets and of firm market capitalisation) is found to be more strongly influential on the tendency to supply reliable environmental disclosure than total reporting quality. In addition, the country characteristic of country of domicile and hence, accounting system, is found to be a highly significant determinant of the reliability. That is firms domiciled in the UK that

use a principles-based financial accounting system are more likely to produce more reliable disclosures than those domiciled in the US under a rules-based reporting system. It is also found that the other two firm characteristics relating to country (cross-listing of shares and proportion of sales revenue outside a firm's home region) have no significant effect on the propensity to disclose more reliable CER. Moreover, independent environmental ratings are revealed not to be a function of reporting reliability.

With regards to sector variation, a clear pattern in relation to industry environmental sensitivity is not shown for the model that uses the natural logarithm of total assets as a proxy for firm size. That is, only firms in the trade sector are weakly significantly less likely to make reliable environmental reporting than firms in the mining sector, whilst all other sectors exhibit no significance with respect to this. However, when the natural logarithm of market capitalisation is used as a proxy for size in the model an ordered pattern representing sector variation appears to be slightly more visible. That is, firms in the manufacturing and trade sectors are significantly less likely to make reliable environmental information disclosures than those in the mining sector.

In contrast to the results for total reporting quality, profitability (as measured by return on shareholder funds or ROE) fails to reach statistical significance regarding its effect on reporting reliability. In addition, contrasting with the strongly negative influence on total reporting quality (and on the disclosure understandability), environmental performance is not found to be influential on the disclosure reliability. Furthermore, there is no association between the reliability of the disclosure and GRI Guidelines use in CER. Moreover, reporting year has no effect on the reporting reliability.

In sum, for the reliability of environmental reporting evidence to support hypotheses *H2*, *H3*, *H4.1* and *H7* is found, but not for *H4.2*, *H4.3*, *H5*, *H6*, *H8*, *H9* and *H10*.

Determinants of CER Comparability and Consistency

Again, the regression results for the comparability and consistency of firm environmental disclosures show some similarities and also some differences to the

results for total reporting quality. With regards to the former, an ordered pattern of sector variation in terms of reporting comparability and consistency is also found. That is, from most to least, firms in the finance, real estate and manufacturing sectors are significantly less likely to produce high comparability and consistency reports than firms in the mining sector. Consistent with the prior evidence, finance firms disclose the least comparability and consistency in their environmental reporting. Firms in manufacturing sectors appear to provide less comparable and consistent CER than those in the mining sector, but their environmental information disclosures have more comparability and consistency than those firms in the real estate sector. However, contrary to expectation and at variance to the results for total reporting quality, firms in the trade sector strongly significantly tend to produce more comparable and consistent environmental reporting than firms in the mining sector.

Moreover, as well as the results found for the total reporting quality, the other two firm characteristics relating to country (cross-listing of shares and proportion of sales revenue outside a firm's home region) are also found to be immaterial when comes to reporting comparability and consistency. In addition, there is a significant link, albeit weak, between firm profitability and comparability and consistency of environmental disclosure. Furthermore, it is found that firm GHGs emissions exert a strongly significant negative effect on reporting comparability and consistency. That is, the greater the GHGs impact the greater the likelihood that a firm will disclose less comparable and consistent environmental information. In addition, while it is found that a firm's listing in independent environmental ratings has no significant effect on its tendency to offer more comparability and consistency in its environmental reporting, the comparability and consistency of voluntary environmental disclosure tends to be significantly higher the later the year the reporting is for (in 2006 in this case).

Whilst size has a weakly significant effect on total reporting quality, it is not found to significantly be a function of reporting comparability and consistency. Additionally, contrary to the regression results for the total quality (and the other three qualitative characteristics), it is remarkable that the country characteristic has no significant effect on a firm's propensity to produce comparable and consistent environmental report. That is, there is no difference between the comparability and consistency in CER of firms domiciled in the UK that apply principles-based financial accounting and those

domiciled in the US using a rules-based financial accounting system. Furthermore, a firm's use of GRI Guidelines in its environmental information disclosure has no significant effect on the likelihood that its disclosure is produced comparably and consistently.

In sum, for the comparability and consistency of CER, whilst there is evidence to support hypotheses *H3*, *H5*, *H6* and *H10*, the findings do not confirm *H2*, *H4.1*, *H4.2*, *H4.3*, *H7*, *H8* and *H9*.

5.4 Tests of CER Behaviours under Institutional Theory

5.4.1 Summary of the Descriptive Statistics

Table 5.7 reports the descriptive statistics for the full sample of firms' environmental disclosure quality for the leader and follower subsamples over time for the four components as well as total quality. In general, the average total CER quality scores of both subsamples show statistically significant increases from 2005 to 2006. That is, the mean total CER quality scores increase from 33.1199 to 36.5310 and from 27.0352 to 30.6917, for the leaders and followers, respectively. However, regarding each individual qualitative characteristic, an increase appears to be insignificant for the mean of some measures in each subsample. That is, only the mean relevance score significantly increases between 2005 and 2006 for lead firms, whereas the mean relevance, reliability and comparability and consistency scores significantly increase from 2005 to 2006 for followers. This suggests that during the two-year period, the leaders paid the most attention to increasing their environmental reporting relevance, whilst the followers included the other qualitative characteristics apart from understandability in their disclosures so as to increase their overall quality.

With respect to the difference between the leaders and followers' CER quality, the total reporting quality scores of the former are significantly higher than those of the latter in

both 2005 and 2006, according to the Mann-Whitney test.[55] This is consistent with the expectation that leaders disclose more quality than followers. However, when each qualitative characteristic is taken into consideration, only the CER reliability and comparability and consistency of the leaders are significantly greater than those of followers in 2005, whilst only the reporting relevance and reliability of the leaders are significantly higher than those of the followers in 2006. That is, only the leaders' reliability is consistently significantly higher than that of the followers for both years.

[55] A non-parametric Mann-Whitney test is employed since the measures of each qualitative characteristic and total reporting quality appear to be non-normally distributed in general and for each of the two years.

Table 5.7: Descriptive Statistics for the Measures of Each Qualitative Characteristic by Subsample

$CERQ_{jt}$ and Q_{jt}	2005			2006			Total		
	Leaders[c]	Followers	Total	Leaders[b],[c]	Followers[b]	Total[a]	Leaders[c]	Followers	Total
Understandability, U_{jt}									
Minimum	0.0000	0.2294	0.0000	5.7798	1.6055	1.6055	0.0000	0.2294	0.0000
Median	9.6330	9.5872	9.6101	9.8165	9.6789	9.7248	9.7248	9.6216	9.6330
Maximum	13.5321	20.6422	20.6422	13.7615	17.3853	17.3853	13.7615	20.6422	20.6422
Mean	9.5459	9.0794	9.2083	10.0136	9.4649	9.6160**	9.7774	9.2707	9.4104
Std. Dev.	2.1895	2.7068	2.5769	1.5712	2.4549	2.2557	1.9135	2.5871	2.4282
Observations	50	131	181	49	129	178	99	260	359
Relevance, $RELE_{jt}$									
Minimum	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Median	5.9888	4.4071	5.2464	6.9429	5.4321	6.1500	6.8036	5.0726	5.6357
Maximum	14.0679	15.4143	15.4143	12.8750	14.1643	14.1643	14.0679	15.4143	15.4143
Mean	5.9202	4.8025	5.1113	6.9334**,**	5.4397***	5.8509***	6.4217***	5.1186	5.4780
Std. Dev.	3.9097	3.8366	3.8785	3.3907	3.9625	3.8627	3.6787	3.9051	3.8829
Observations	50	131	181	49	129	178	99	260	359
Reliability, $RELI_{jt}$									
Minimum	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Median	7.6923	5.7692	6.7308	7.6923	5.7692	6.7308	7.6923	5.7692	6.7308
Maximum	16.3462	19.2308	19.2308	18.2692	17.3077	18.2692	18.2692	19.2308	19.2308
Mean	8.6538**	6.5693	7.1451	9.1248**	7.0662***	7.6329**	8.8869***	6.8158	7.3870
Std. Dev.	5.1139	4.6561	4.8631	4.8002	4.7497	4.8387	4.9414	4.7003	4.8504
Observations	50	131	181	49	129	178	99	260	359
Comparability and Consistency, C_{jt}									
Minimum	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Median	12.5000	0.0000	0.0000	12.5000	12.5000	12.5000	12.5000	0.0000	0.0000
Maximum	25.0000	25.0000	25.0000	25.0000	25.0000	25.0000	25.0000	25.0000	25.0000
Mean	9.0000*	6.5840	7.2514	10.4592	8.7209***	9.1994***	9.7222*	7.6442	8.2173
Std. Dev.	9.1194	8.8154	8.9408	10.3163	9.0577	9.4232	9.7080	8.9832	9.2221
Observations	50	131	181	49	129	178	99	260	359
Total CER Quality, Q_{it}									
Minimum	0.9865	2.4087	0.9865	5.7798	1.9037	1.9037	0.9865	1.9037	0.9865
Median	32.2556	27.1168	28.2406	35.2736	29.9501	31.6247	33.0960	28.1543	29.6673
Maximum	63.4586	60.3961	63.4586	62.0804	64.5207	64.5207	63.4586	64.5207	64.5207
Mean	33.1199**	27.0352	28.7161	36.5310**,**	30.6917***	32.2992***	34.8082***	28.8494	30.4926
Std. Dev.	16.0123	14.6549	15.2430	14.7307	15.6317	15.5689	15.4084	15.2287	15.4882
Observations	50	131	181	49	129	178	99	260	359

(a) $CERQ_{jt}$ mean significantly different from that of 2005 according to the Wilcoxon signed-rank test at the 10% level (*), at the 5% level (**) and at the 1% level (***).
(b) $CERQ_{jt}$ mean significantly different from that of 2005 according to the Wilcoxon signed-rank test or the Paired t-test, depending on its distribution at the 10% level (*), at the 5% level (**) and at the 1% level (***).
(c) $CERQ_{jt}$ mean significantly different from that of the followers' firms according to the Mann-Whitney test at the 10% level (*), at the 5% level (**) and at the 1% level (***).

Table 5.8 depicts a cross-matrix of environmental disclosure quality by industry sector and by component of disclosure quality. Generally, the firms represent a wide range of industry sectors as classified by the ISIC Rev.3.1 (United Nations, 2002). There is a statistically significant difference in reporting quality among the ten types of industry sectors for both the leader and follower subsamples, except for the understandability scores for the former. In relation to this, the average total reporting quality from firms in the construction sector is the least among the lead firms, whilst firms in the other service activities sector have the least mean total quality score among the follower firms.[56] Moreover, among the leaders' firms the average total quality is high in the mining and trade sectors, whereas the highest mean total quality score is found in firms that are followers in the trade sector. This is noteworthy since the trade sector would be expected to be non-environmentally sensitive. By way of explanation, this high average environmental disclosure quality could be due to firms in this sector having high logistics involvement causing significant indirect impacts on the environment, such as transport usage, a matter discussed further in the next chapter in conjunction with the results of the first study.

[56] There is no firm in the construction sector appearing in followers' subsample. In fact, only one firm from the construction sector (two observations, one each for year 2005 and 2006) is included in the sample. The second lowest quality disclosure is that of the leaders in the other service activities.

Table 5.8: Mean Scores for the Measures of Each Qualitative Characteristic and for Total Quality by Industry Sector

$CERQ_{jt}$ and Q_{jt}	Industry Sector, $INDUSTRY10_{jt}$																	
	$INDMining_{jt}$			$INDManu_{jt}$			$INDUtilities_{jt}$			$INDConstruct_{jt}$			$INDTrade_{jt}$			$INDHotel_{jt}$		
	2005	2006	Total	2005	2006	Total	2005	2006	Total	2005	2006	Total	2005	2006	Total	2005	2006	Total
Leaders																		
Understandability, U_{jt}	9.8796	10.0401	9.9599	9.2932	9.8242	9.5525	10.0917	10.7569	10.4243	9.8624	10.7569	10.3096	11.0933	11.1009	11.0971	9.2661	10.1950	9.7305
Relevance, $RELE_{jt}$	10.3395	10.3956	10.3675	6.0777	7.7122	6.8759	6.6397	7.0782	6.8590	5.1967	4.5309	4.8638	6.1869	6.0595	6.1232	3.8554	4.4321	4.1438
Reliability, $RELI_{jt}$	15.3846	15.1442	15.2644	7.9108	8.6538	8.2737	11.2180	10.5769	10.8974	2.8846	2.8846	2.8846	8.3333	7.6923	8.0128	6.2500	5.7692	6.0096
Comparability and Consistency, C_{jt}	15.6250	15.6250	15.6250	7.9545	8.9286	8.4302	12.5000	4.1667	8.3333	0.0000	0.0000	0.0000	20.8333	25.0000	22.9167	12.5000	18.7500	15.6250
Total CER Quality, Q_{jt}	51.2287	51.2049	51.2168	31.2362	35.1187	33.1323	40.4494	32.5787	36.5141	17.9437	18.1724	18.0580	46.4468	49.8528	48.1498	31.8714	39.1463	35.5089
Number of Observations	4	4	8	22	21	43	3	3	6	1	1	2	3	3	6	2	2	4
Followers																		
Understandability, U_{jt}	9.0867	8.9262	9.0065	8.8918	8.9929	8.9417	9.3611	10.0033	9.6822				10.0494	11.0462	10.5478	9.9885	10.5275	10.2580
Relevance, $RELE_{jt}$	6.4581	6.8996	6.6788	5.9421	5.7827	5.8634	7.1589	8.0065	7.5827				5.1305	6.9341	6.0323	2.6571	5.0214	3.8393
Reliability, $RELI_{jt}$	9.3531	8.7413	9.0472	6.7308	6.5865	6.6595	8.3791	10.7143	9.5467				5.9911	6.6568	6.3240	3.8462	5.7692	4.8077
Comparability and Consistency, C_{jt}	5.6818	6.8182	6.2500	7.3171	8.4375	7.8704	7.1429	7.1429	7.1429				14.4231	18.2692	16.3462	12.5000	18.7500	15.6250
Total CER Quality, Q_{jt}	30.5798	31.3852	30.9825	28.8818	29.7996	29.3350	32.0420	35.8670	33.9545				35.5941	42.9063	39.2502	28.9918	40.0682	34.5300
Number of Observations	11	11	22	41	40	81	7	7	14	0	0	0	13	13	26	2	2	4

Table 5.8: Mean Scores for the Measures of Each Qualitative Characteristic and for Total Quality by Industry Sector (continued)

$CERQ_{jt}$ and Q_{jt}	Industry Sector, $INDUSTRY10_{jt}$												Total		
	$INDTransport_{jt}$			$INDFinance_{jt}$			$INDRealEstate_{jt}$			$INDOthers_{jt}$					
	2005	2006	Total	2005	2006	Total	2005	2006	Total	2005	2006	Total	2005	2006	Total[(a)]
Leaders															
Understandability, U_{jt}	9.3807	8.9450	9.1628	10.5103	9.9599	10.2351	9.6560	10.4083	10.0321	6.7661	9.9083	8.3372	9.5459	10.0136	9.7774
Relevance, $RELE_{jt}$	5.4494	6.5070	5.9782	4.9655	6.0922	5.5289	4.1824	5.0896	4.6360	3.4911	3.7732	3.6321	5.9202	6.9334	6.4217**
Reliability, $RELI_{jt}$	9.3750	10.0962	9.7356	12.0192	13.2212	12.6202	5.7692	5.7692	5.7692	4.3269	6.7308	5.5288	8.6538	9.1248	8.8869***
Comparability and Consistency, C_{jt}	6.2500	9.3750	7.8125	6.2500	3.1250	4.6875	5.0000	12.5000	8.7500	6.2500	12.5000	9.3750	9.0000	10.4592	9.7222**
Total CER Quality, Q_{jt}	30.4552	34.9231	32.6892	33.7451	32.3982	33.0716	24.6076	33.7671	29.1874	20.8341	32.9122	26.8731	33.1199	36.5310	34.8082**
Number of Observations	4	4	8	4	4	8	5	5	10	2	2	4	50	49	99
Followers															
Understandability, U_{jt}	7.8010	9.3218	8.5107	8.9133	9.3423	9.1278	9.9738	10.5308	10.2523	9.3440	8.7523	9.0482	9.0794	9.4649	9.2707**
Relevance, $RELE_{jt}$	3.9018	4.7934	4.3179	2.8398	3.8350	3.3374	6.5531	7.2006	6.8769	2.0364	2.4857	2.2611	4.8025	5.4397	5.1186***
Reliability, $RELI_{jt}$	5.6490	6.3187	5.9615	5.9252	6.4709	6.1980	7.8297	9.7527	8.7912	3.6538	5.3846	4.5192	6.5693	7.0662	6.8158**
Comparability and Consistency, C_{jt}	9.3750	10.7143	10.0000	3.0405	4.7297	3.8851	3.5714	14.2857	8.9286	5.0000	7.5000	6.2500	6.5840	8.7209	7.6442***
Total CER Quality, Q_{jt}	26.7269	31.1481	28.7901	20.7189	24.3780	22.5484	27.9280	41.7698	34.8489	20.0343	24.1226	22.0785	27.0352	30.6917	28.8494***
Number of Observations	8	7	15	37	37	74	7	7	14	5	5	10	131	129	260

(a) Mean significantly different among the ten types of industry sectors according to the one-way ANOVA or Kruskal Wallis test depending on its distribution, at the 10% level (*), at the 5% level (**) and at the 1% level (***).

In addition, in relation to the approach using year-specific OLS regressions to test for mimetic behaviour per institutional theory, following that employed by Cormier et al. (2005), table 5.9 provides the descriptive statistics for the restricted sample for each qualitative characteristic and total quality, standardised by country- and year-specific industry median scores and for all the explanatory variables. As explained above, the restricted sample is employed for the regressions, because there are cases where the relevant data are missing. Moreover, the number of observations has been reduced to 106 (37 and 69 from 2005 and 2006, respectively) for the regressions of the standardised comparability and consistency scores owing to the null values of the denominator.[57]

Generally, for both 2005 and 2006 the average values for each characteristic of the US firms are a significantly greater distance away from the industry median scores than those for the UK ones. The exceptions are those of the understandability scores in both years and the comparability and consistency score in 2006. That is, this finding suggests that understandability is the qualitative characteristic that firms in both countries pay similar attention to in their CER. In addition, for both year-specific regressions multicollinearity exists owing to there being a range of categorical variables in the model. In this regard, the figures for the categorical variables in Panel B show that a greater proportion of the UK companies are cross-listed in other countries in both 2005 and 2006 and listed in an independent ratings index in 2006. Moreover, regarding the continuous explanatory variables in Panel C, $SIZE_j$ is significantly higher, at the 5% level, in the US companies for both years. $SALES\ OUTS_j$ is also significantly greater, at the 1% level, in the US companies in 2006. Furthermore, the Pearson correlation results in Panel C indicate that $SALES\ OUTS_j$ and $EMISSIONS_j$ are positively correlated at the 5% level, with coefficient values of 0.3229 and 0.2338 in 2005 and 2006, respectively. These significantly positive correlations suggest that a firm with a high proportion of sales revenue outside its home region tends to cause high GHGs emissions, thus again presenting multicollinearity.

With regards to the existence of multicollinearity, when the potential impact of the relationships between the explanatory variables is reviewed in the context of the

[57] The nature of the explanatory variables of this further restricted sample is similar to that of the original restricted sample and hence they are not provided in table 5.9.

regression results, it emerges that this is trivial. Additionally, in order to establish the robustness of the parameter estimates some auxiliary regressions were performed and there was a consistently strong pattern of statistical significance and constant coefficient estimates under this procedure. Therefore, it is believed that multicollinearity can be considered immaterial for the model specification for each year-specific regression. However, the regression results in this case are not considered as the focus is on investigating the convergence of a firm's reporting quality towards the industry medians across the two-year period, through examining the changing variance in the residuals for each year-specific regression.

Table 5.9: Summary of the Descriptive Statistics for the Dependent and Explanatory Variables

	2005, $YEAR_j$ = 1			2006, $YEAR_j$ = 2		
	Country/Accounting System, $COUNTRY_j$			Country/Accounting System, $COUNTRY_j$		
	UK (= 1)	US (= 0)[a]	Total	UK (= 1)	US (= 0)[a]	Total
Panel A: Dependent Variables, $CERQ_j/Mdn_j$ and Q_j/Mdn_j						
Understandability, U_j/Mdn_j						
Minimum	0.8557	0.7561	0.7561	0.8188	0.5182	0.5182
Median	1.0000	1.0323	1.0083	1.0048	1.0097	1.0049
Maximum	1.2930	1.6864	1.6864	1.5726	1.9410	1.9410
Mean	1.0201	1.1198	1.0653	1.0339	1.0295	1.0321
Std. Dev.	0.0752	0.2374	0.1752	0.1179	0.2025	0.1581
Observations	41	34	75	48	35	83
Relevance, $RELE_j/Mdn_j$						
Minimum	0.3287	0.0000	0.0000	0.1246	0.0177	0.0177
Median	1.0000	1.1071	1.0374	1.0000	1.1176	1.0451
Maximum	1.7642	24.9253	24.9253	2.3360	105.4286	105.4286
Mean	1.0447	2.0100*	1.4823	1.0718	4.7490*	2.6224
Std. Dev.	0.2881	4.1023	2.7899	0.3661	17.7944	11.6062
Observations	41	34	75	48	35	83
Reliability, $RELI_j/Mdn_j$						
Minimum	0.5217	0.0000	0.0000	0.2609	0.3333	0.2609
Median	1.0323	1.1667	1.0625	1.0000	1.1667	1.0435
Maximum	1.8889	6.5000	6.5000	1.9000	4.8000	4.8000
Mean	1.1084	1.5729*	1.3190	1.0513	1.4264**	1.2095
Std. Dev.	0.3129	1.1587	0.8402	0.2998	0.8774	0.6367
Observations	41	34	75	48	35	83
Comparability and Consistency, C_j/Mdn_j						
Minimum	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Median	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Maximum	2.0000	4.0000	4.0000	2.0000	4.0000	4.0000
Mean	0.8913	1.3571*	1.0676	0.9286	1.1852	1.0290
Std. Dev.	0.5213	0.9379	0.7323	0.5903	1.1107	0.8353
Observations	23	14	37	42	27	69
Total CER Quality, Q_j/Mdn_j						
Minimum	0.5794	0.5761	0.5761	0.5085	0.5110	0.5085
Median	1.0000	1.1198	1.0244	1.0094	1.1494	1.0355
Maximum	1.8902	3.2286	3.2286	2.0829	4.9437	4.9437
Mean	1.0561	1.3293**	1.1800	1.0538	1.2990*	1.1572
Std. Dev.	0.2288	0.6015	0.4565	0.2567	0.7559	0.5381
Observations	41	34	75	48	35	83
Panel B: Categorical Explanatory Variables						
Industry Sector, $INDUSTRY10_j$						
1 = Mining, $INDMining_j$	7	4	11	7	4	11
2 = Manufacturing, $INDManu_j$	14	25	39	13	25	38
3 = Utilities, $INDUtilities_j$	5	0	5	6	0	6
5 = Trade, $INDTrade_j$	5	0	5	5	0	5
7 = Transport, $INDTransport_j$	2	2	4	4	2	6
8 = Finance, $INDFinance_j$	4	1	5	5	1	6
9 = Real Estate, $INDRealEstate_j$	4	2	6	6	2	8
10 = Other Service Activities, $INDOthers_j$	0	0	0	2	1	3
Total Observations	41	34	75	48	35	83
	Fisher's exact p = 0.008			Fisher's exact p = 0.003		
Cross-Listing of Shares, $CROSS\ LISTING_j$						
1 = Other Country(ies) Shares Listed	26	14	40	32	12	44
0 = Non-Other Country(ies) Shares Listed	15	20	35	16	23	39
Total Observations	41	34	75	48	35	83
	χ^2 = 3.6931, p = 0.055			χ^2 = 8.5202, p = 0.004		
GRI Guidelines Application, $GRI\ APP_j$						
1 = GRI Guidelines Application	17	20	37	24	19	43
0 = Non-GRI Guidelines Application	24	14	38	24	16	40
Total Observations	41	34	75	48	35	83
	χ^2 = 2.2410, p = 0.134			χ^2 = 0.1489, p = 0.700		
Independent Environmental Ratings, $INDEX_j$						
1 = FTSE4Good/DJSI US Listed	31	23	54	42	22	64
0 = FTSE4Good/DJSI US Non-Listed	10	11	21	6	13	19
Total Observations	41	34	75	48	35	83
	χ^2 = 0.5846, p = 0.445			χ^2 = 6.9636, p = 0.008		
Panel C: Continuous Explanatory Variables						
Organisational Size, $SIZE_j$ (By Natural Logarithm of Total Assets)						
Minimum	20.7372	23.1398	20.7372	21.5907	23.2932	21.5907
Median	23.8172	24.3018	24.0954	23.8197	24.5203	24.1232
Maximum	28.0378	28.0325	28.0378	28.2520	28.2646	28.2646
Mean	23.9455	24.5827	24.2344	24.0178	24.6731	24.2941
Std. Dev.	1.3399	1.0592	1.2541	1.2726	1.0832	1.2332
Observations	41	34	75	48	35	83
	ANOVA, F = 5.06, p = 0.0275			ANOVA, F = 6.07, p = 0.0159		
Proportion of Sales Revenue outside a Firm's Home Region, $SALES\ OUTS_j$						
Minimum	0.0000	0.2747	0.0000	0.0000	3.9135	0.0000
Median	50.9483	49.7072	50.9483	34.2536	46.9928	46.5744
Maximum	100.0000	86.3883	100.0000	100.0000	94.2323	100.0000

Table 5.9: Summary of the Descriptive Statistics for the Dependent and Explanatory Variables (continued)

	2005, $YEAR_i = 1$			2006, $YEAR_i = 2$		
	Country/Accounting System, $COUNTRY_i$			Country/Accounting System, $COUNTRY_i$		
	UK (= 1)	US (= 0)[a]	Total	UK (= 1)	US (= 0)[a]	Total
Mean	42.5630	51.1234	46.4437	35.6988	51.5256	42.3728
Std. Dev.	30.0041	16.8716	25.1389	30.1526	19.3471	27.1688
Observations	41	34	75	48	35	83
	ANOVA, F = 2.19, p = 0.1432			ANOVA, F = 7.41, p = 0.0080		
Financial Performance, $FIN\ PERF_i$						
Minimum	-5.9100	6.7300	-5.9100	-17.3900	13.2600	-17.3900
Median	31.8200	35.1350	34.5600	23.3550	31.7500	27.5200
Maximum	496.1500	67.9000	496.1500	659.5000	113.8600	659.5000
Mean	45.8699	34.1103	40.5389	45.1379	33.3843	40.1816
Std. Dev.	77.2946	12.8814	57.7768	97.2805	19.2256	74.9103
Observations	41	34	75	48	35	83
	ANOVA, F = 0.77, p = 0.3838			ANOVA, F = 0.50, p = 0.4836		
Environmental Performance, $EMISSIONS_j$						
Minimum	0.2919	-1.1132	-1.1132	0.8689	2.1908	0.8689
Median	4.0169	4.3598	4.1858	4.2656	4.2677	4.2677
Maximum	10.3903	7.6959	10.3903	10.2684	7.6894	10.2684
Mean	4.8335	4.5027	4.6836	4.7726	4.5264	4.6688
Std. Dev.	2.5641	1.6529	2.1908	2.1880	1.3293	1.8686
Observations	41	34	75	48	35	83
	ANOVA, F = 0.42, p = 0.5188			ANOVA, F = 0.35, p = 0.5565		

Pearson Correlation Coefficient

	$SIZE_i$	$SALES\ OUTS_j$	$FIN\ PERF_i$	$EMISSIONS_j$	$SIZE_i$	$SALES\ OUTS_j$	$FIN\ PERF_i$	$EMISSIONS_j$
$SIZE_i$	1.0000				1.0000			
$SALES\ OUTS_j$	0.0284	1.0000			0.1089	1.0000		
$FIN\ PERF_i$	-0.1294	-0.1555	1.0000		-0.1257	-0.1491	1.0000	
$EMISSIONS_j$	-0.0855	0.3229**	-0.0483	1.0000	-0.0162	0.2338**	-0.1327	1.0000

* denotes significant at the 10% level. ** denotes significant at the 5% level.
(a) $CERQ_i/Mdn_i$ mean significantly different from that of the UK firms according to the Mann-Whitney test at the 10% level (*), at the 5% level (**) and at the 1% level (***).

5.4.2 Results and Analysis

Mann-Whitney Test and One Sample t-test or One Sample Median Test (Wilcoxon Signed-rank Test)

In table 5.10, the results of the tests for reporting convergence with regards to the full sample are presented. That is, here, the basis for testing this convergence using Mann-Whitney tests of the difference between the disclosure quality scores of leaders and followers in 2005 is shown. In addition, the evidence for whether reporting convergence exists or not, i.e. eliciting if there is mimetic/coercive behaviour, is gathered by performing a one sample t-test or a Wilcoxon signed-rank test, depending on the distribution of the changed scores, $\Delta CERQ_{jt}$ and ΔQ_{jt}, over the two year period, as explained in chapter 4 and this is also shown in the table. The reporting practices of the leader and follower subsamples in relation to total reporting quality will be discussed first and then the practices regarding each component of reporting quality will be sequentially analysed.

Table 5.10: Tests for Convergence in Environmental Disclosure Quality according to the Mann-Whitney Test and One Sample t-test or One Sample Median Test (Wilcoxon Signed-rank Test)

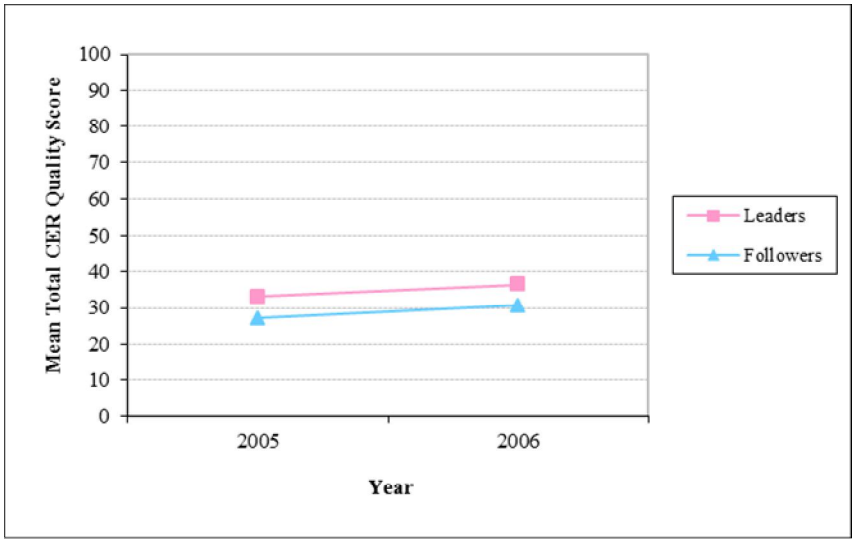
$CERQ_{jt}$ and Q_{jt}	2005			2006			$\Delta CERQ_{jt}$ and ΔQ_{jt}				
	Leaders[a]	Followers	Total	Leaders[b]	Followers[b]	Total	Leaders[c]		Followers[c]		Total
Understandability, U_{jt}											
Minimum	0.0000	0.2294	0.0000	5.7798	1.6055	1.6055	-3.3716		-11.8578		-11.8578
Median	9.6330	9.5872	9.6101	9.8165	9.6789	9.7248	0.2523		0.1147		0.1606
Maximum	13.5321	20.6422	20.6422	13.7615	17.3853	17.3853	6.0550		7.5459		7.5459
Mean	9.5459	9.0794	9.2083	10.0136	9.4649	9.6160	0.4465	z = 1.5670	0.3481	z = 1.4610	0.3752
Std. Dev.	2.1895	2.7068	2.5769	1.5712	2.4549	2.2557	1.9274	(p = 0.1172)	2.5594	(p = 0.1440)	2.3972
Observations	50	131	181	49	129	178	49		129		178
Relevance, $RELE_{jt}$											
Minimum	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-6.6946		-5.6345		-6.6946
Median	5.9888	4.4071	5.2464	6.9429	5.4321	6.1500	0.5663		0.2643		0.3617
Maximum	14.0679	15.4143	15.4143	12.8750	14.1643	14.1643	10.6265		7.5607		10.6265
Mean	5.9202	4.8025	5.1113	6.9334**	5.4397***	5.8509	0.9077***	z = 2.6410	0.6824***	z = 4.0980	0.7444
Std. Dev.	3.9097	3.8366	3.8785	3.3907	3.9625	3.8627	2.9757	(p = 0.0083)	1.9094	(p = 0.0000)	2.2468
Observations	50	131	181	49	129	178	49		129		178
Reliability, $RELI_{jt}$											
Minimum	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-7.6923		-7.6923		-7.6923
Median	7.6923	5.7692	6.7308	7.6923	5.7692	6.7308	0.0000		0.0000		0.0000
Maximum	16.3462	19.2308	19.2308	18.2692	17.3077	18.2692	12.5000		10.5769		12.5000
Mean	8.6538**	6.5693	7.1451	9.1248	7.0662***	7.6329	0.3532	z = 0.2260	0.4696***	z = 2.6440	0.4376
Std. Dev.	5.1139	4.6561	4.8631	4.8002	4.7497	4.8387	3.4317	(p = 0.8214)	2.5838	(p = 0.0082)	2.8327
Observations	50	131	181	49	129	178	49		129		178
Comparability and Consistency, C_{jt}											
Minimum	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-25.0000		-25.0000		-25.0000
Median	12.5000	0.0000	0.0000	12.5000	12.5000	12.5000	0.0000		0.0000		0.0000
Maximum	25.0000	25.0000	25.0000	25.0000	25.0000	25.0000	12.5000		25.0000		25.0000
Mean	9.0000*	6.5840	7.2514	10.4592	8.7209***	9.1994	1.5306	z = 1.6250	2.2287***	t = 3.0921	2.0365
Std. Dev.	9.1194	8.8154	8.9408	10.3163	9.0577	9.4232	7.9191	(p = 0.1042)	8.1863	(p = 0.0024)	8.0974
Observations	50	131	181	49	129	178	49		129		178
Total CER Quality, Q_{jt}											
Minimum	0.9865	2.4087	0.9865	5.7798	1.9037	1.9037	-24.9962		-24.5778		-24.9962
Median	32.2556	27.1168	28.2406	35.2736	29.9501	31.6247	1.9786		1.9728		1.9757
Maximum	63.4586	60.3961	63.4586	62.0804	64.5207	64.5207	26.8162		28.9330		28.9330
Mean	33.1199**	27.0352	28.7161	36.5310**	30.6917***	32.2992	3.2381**	t = 2.1436	3.7287***	t = 4.1580	3.5936
Std. Dev.	16.0123	14.6549	15.2430	14.7307	15.6317	15.5689	10.5740	(p = 0.0372)	10.1851	(p = 0.0001)	10.2659
Observations	50	131	181	49	129	178	49		129		178

(a) $CERQ_{jt}$ mean significantly different from that of the followers' firms according to the Mann-Whitney test at the 10% level (*), at the 5% level (**) and at the 1% level (***).
(b) $CERQ_{jt}$ mean significantly different from that of 2005 according to the Wilcoxon signed-rank test or Paired t-test, depending on its distribution, at the 10% level (*), at the 5% level (**) and at the 1% level (***).
(c) $\Delta CERQ_{jt}$ mean/median significantly different from 0 according to the one sample t-test or one sample median test (Wilcoxon signed-rank test) depending on its distribution, i.e. H0: $\Delta CERQ_{jt}$ mean/median = 0, at the 10% level (*), at the 5% level (**) and at the 1% level (***).

Total CER Quality

The basis for testing for reporting convergence is shown, since the total CER quality of the leaders is significantly higher than that of the followers in 2005. With regards to the change of the total CER quality scores between 2005 and 2006, the results indicate that the mean of the variable ΔQ_{jt} for the followers group (3.7287) is statistically significantly greater than zero. In other words, when it is found that their leaders have higher CER quality than that of themselves in 2005, follower firms appear to adjust their total CER quality upwards across the years, thus providing support for institutional theory's concept of mimetic behaviour (supporting *H10.1* and *H10.2*). However, reporting convergence is not apparent because the mean of ΔQ_{jt} for the lead firms (3.2381) is also statistically significantly greater than zero. That is, the reporting practices of the leaders also increased between the two years, which is consistent with the idea these firms tend to provide their environmental disclosure owing to public pressures, in accordance with the stakeholder and legitimacy theories, rather than imitating those of firms in their own industry sector, in the previous period. The observed total reporting quality practice is shown in the figure 5.3 below.

Figure 5.3: The Observed Total CER Quality

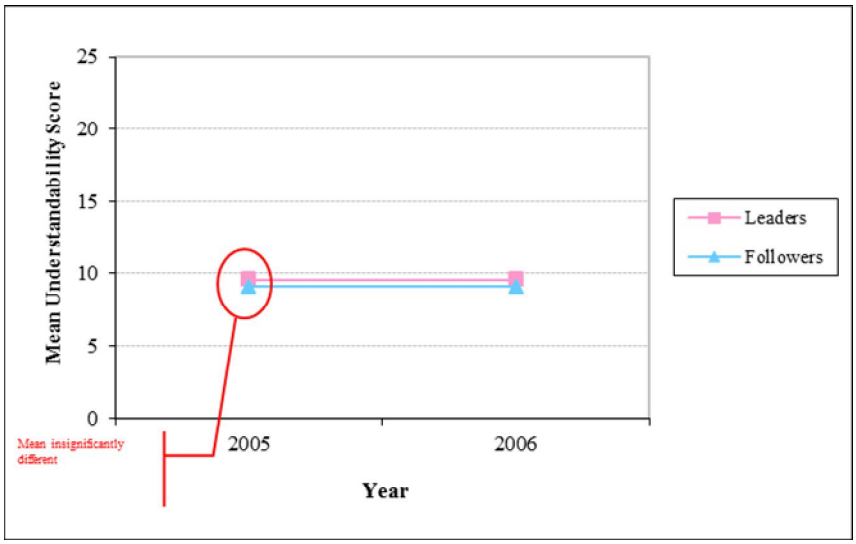


Understandability

With regards to the components of the reporting quality measures, in particular with regards to understandability, the results show that there is a weak basis for testing for reporting convergence. That is, there is no statistically significant difference between the understandability scores of leaders and followers in 2005, hence convergence, representing mimetic behaviour, in relation to this qualitative characteristic over the two years would not be found.

In addition, the medians of the variable ΔU_{jt} for both the subsamples (0.2523 and 0.1147, for leaders and followers, respectively) are not statistically significantly greater than zero, suggesting there is no change in the understandability of the leaders' reporting as well as that of the followers, across the years. In this regard, it can be said that in 2006 the follower firms do not imitate the leaders' 2005 reporting practice, but rather they tend to give the environmental disclosures in a routine fashion that relies on their own existing practice. That is, these firms' CER understandability is found to demonstrate institutional theory's coercive behaviour across the two years, which is similarly found in the disclosure practice of the lead firms over the study period. In sum, the findings for the reporting practices of the sample firms in relation to the understandability characteristic between 2005 and 2006 is consistent with coercive behaviour as per institutional theory and thus, *H10.1* and *H10.2* are rejected. This is illustrated in the figure 5.4 below.

Figure 5.4: The Observed CER Understandability

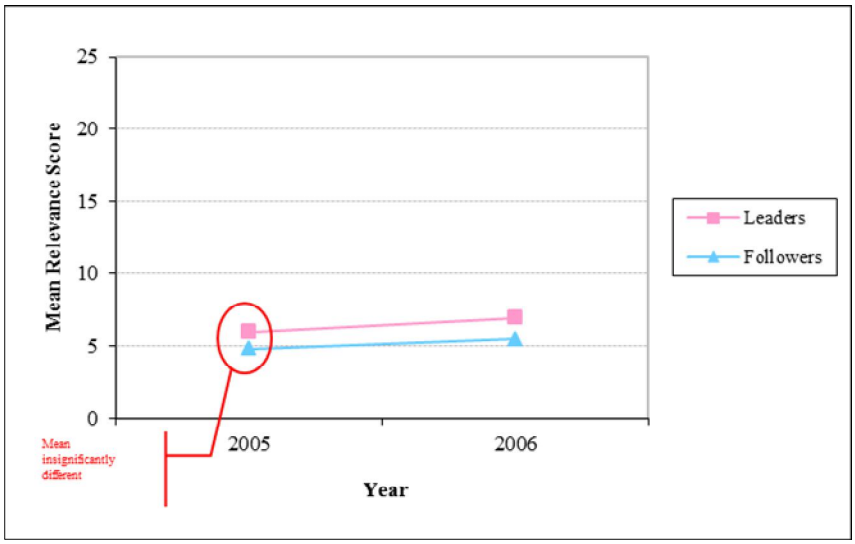


Relevance

As regards to the relevance of CER, a weak basis for testing for reporting convergence is also found, since there is no statistically significant difference between the relevance scores of leaders and followers in 2005. Therefore, convergence and hence, mimetic behaviour, regarding this component of reporting quality over the two years, does not exist.

Turning to the change in reporting relevance between 2005 and 2006, the results show that the medians of the variable $\Delta RELE_{jt}$ for both the subsamples (0.5663 and 0.2643, for leaders and followers, respectively) are statistically significantly greater than zero, suggesting there is an upward trend in the leaders' reporting relevance, as well as for that of the followers, across the years. In relation to this, both the leader and follower firms, apparently, rather than imitating the previous period practices of their peers in the sector or retaining their existing practices, increase their reporting relevance over the two years as a reaction to the public pressures pertaining to environmentally related information in accordance with the stakeholder and legitimacy theory. That is, neither mimetic nor coercive behaviour per institutional theory is found in the reporting relevance between 2005 and 2006 (rejecting *H10.1* and *H10.2*). The observed reporting relevance practice is shown in figure 5.5 below.

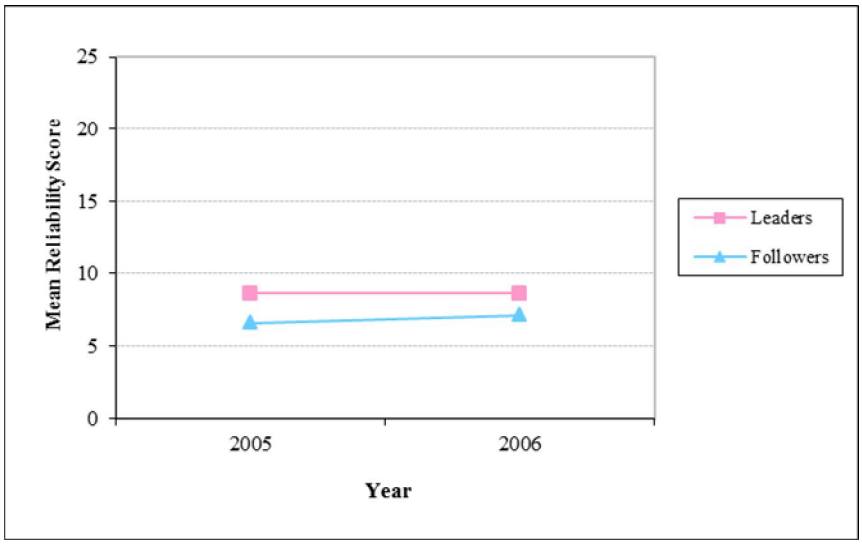
Figure 5.5: The Observed CER Relevance



Reliability

The results show that the CER reliability of leaders is higher than that of the followers in 2005 and hence, there is a strong basis for testing for reporting reliability convergence. With regards to the convergence test, the median of the variable $\Delta RELI_{jt}$ for the followers group is statistically significantly greater than zero. That is, because the leaders have higher CER reliability than the followers in 2005, the latter firms increase this qualitative component in their reporting in the subsequent year as much as possible so as to be in line with the former. This indicates that there is institutional theory's mimetic behaviour in the followers' reporting practice. In relation to this, convergence at best of reporting reliability is evidenced, because the median of $\Delta RELI_{jt}$ for the lead firms is not statistically significantly greater than zero. The constant reliability of the leaders' CER over the two years also signifies mimetic behaviour, whereby having observed the level of disclosure by the followers in the previous year they choose not to increase their level any further. In sum, the CER reliability across the two years is generally consistent with mimetic behaviour as per institutional theory, thus supporting *H10.1* and *H10.2*, and this is depicted in figure 5.6 below.

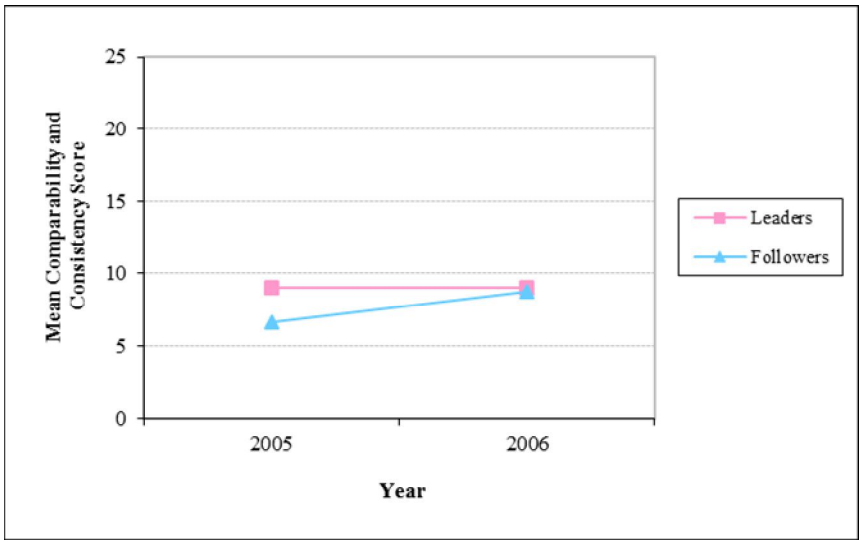
Figure 5.6: The Observed CER Reliability



Comparability and Consistency

Similar to the results found for the reporting reliability, there is a strong basis for testing for CER comparability and consistency convergence, because the comparability and consistency of the leaders is higher than that of the followers in 2005. With regards to the change of the comparability and consistency scores between 2005 and 2006, the mean ΔC_{jt} for the followers group (2.2287) is statistically significantly greater than zero. This indicates that follower firms tend to improve the comparability and consistency in their reporting in the subsequent year in an attempt to have it match that of the leaders in the previous year. That is, the reporting practice of the followers group regarding the comparability and consistency qualitative characteristic is mimetic. In addition, the median of ΔC_{jt} for the leaders firms is not statistically significantly greater than zero. This suggests that the lead firms have recognised the lower comparability and consistency in their followers' disclosures compared to their own and do wish to increase theirs any further. Therefore, convergence at best for reporting comparability and consistency of leaders and followers over the two years is assumed. That is, the CER comparability and consistency across the two years is generally consistent with mimetic behaviour as per institutional theory, thus supporting *H10.1* and *H10.2*, and this is shown in the figure 5.7 below.

Figure 5.7: The Observed CER Comparability and Consistency



Year-specific OLS Regressions

Table 5.11 presents the results of year-specific pooled OLS regressions for investigating whether there is convergence of the restricted sample[58] firms' CER quality scores towards industry medians and hence, mimetic behaviour, over the 2-year period from 2005 to 2006, following Cormier et al.'s (2005) approach. The analysis involves a comparison in the variance in the residuals across the period of the year-specific OLS regressions, with the CER quality scores standardised by country- and year-specific industry median of these scores as the dependent variables and proxies for other possible determinants as the explanatory variables. These are discussed in a similar way as the above, i.e. total reporting quality is discussed first and then the components of reporting quality are sequentially analysed.

[58] Except for that of comparability and consistency where the sample is reduced to 106 observations, as explained above.

Table 5.11: Tests for Convergence in the Environmental Disclosure Quality according to Year-specific OLS Regressions

$CERQ_j/Mdn_j$ and Q_j/Mdn_j	$YEAR_j$		Convergence/ Divergence Possibility	Levene's Test for Equality of Variances
	2005	2006		
Understandability, U_j/Mdn_j				
MS_R from Year-specific OLS Regressions	0.0290	0.0216	Convergence	F = 1.2283
Mean	1.0653	1.0321		(p = 0.3635)
Std. Dev.	0.1752	0.1581		
Observations	75	83		
Relevance, $RELE_j/Mdn_j$				
MS_R from Year-specific OLS Regressions	6.3772	77.8615	Divergence***	F = 0.0578
Mean	1.4823	2.6224		(p = 0.0000)
Std. Dev.	2.7899	11.6062		
Observations	75	83		
Reliability, $RELI_j/Mdn_j$				
MS_R from Year-specific OLS Regressions	0.5416	0.2938	Convergence**	F = 1.7410
Mean	1.3190	1.2095		(p = 0.0148)
Std. Dev.	0.8402	0.6367		
Observations	75	83		
Comparability and Consistency, C_j/Mdn_j				
MS_R from Year-specific OLS Regressions	0.5085	0.7450	Divergence	F = 0.7686
Mean	1.0676	1.0290		(p = 0.3923)
Std. Dev.	0.7323	0.8353		
Observations	37	69		
Total CER Quality, Q_j/Mdn_j				
MS_R from Year-specific OLS Regressions	0.1589	0.1935	Divergence	F = 0.7198
Mean	1.1800	1.1572		(p = 0.1516)
Std. Dev.	0.4565	0.5381		
Observations	75	83		

* denotes significant at the 10% level, ** denotes significant at the 5% level and *** denotes significant at the 1% level, according to the Levene's test.

The results show that the range of total CER quality scores, normalised by the country- and year-specific industry median quality scores, seems to be widening over time, with larger standard deviations in reporting quality around the median scores in 2006 than in 2005. This finding suggests that the quality of firms' environmental disclosures does not converge towards industry median scores, which is inconsistent with industrial mimetic reporting posited under institutional theory and also contradicts the finding of Cormier et al. (2005). In addition, the increase in the variance in the residuals across the two-year period of year-specific OLS regressions, i.e., from the residual mean squares (MS_R) = 0.1589 in 2005 to MS_R = 0.1935 in 2006 OLS regressions, also reveals reporting divergence and thus, the absence of mimetic behaviour over time. However, Levene's

test for equality of variances reveals an *F*-statistic of 0.7198 (p = 0.1516), which indicates that this divergence of the total CER quality is not statistically significant.

Considering each component of the CER quality in turn, for the reporting understandability, a decline in the standard deviations around the median scores between 2005 and 2006 is found and hence, suggests convergence. That is, the result points to firms' CER understandability being inclined to converge towards their industry median scores, thus supporting the institutional theory regarding the proposition of there being industrial mimetic reporting behaviour. Convergence and thus mimetic reporting towards industry medians over time, is also shown by the results of the year-specific OLS regressions of understandability, which show a drop in the variances of the residuals between 2005 and 2006, with MS_R = 0.0290 and 0.0216 in 2005 and 2006, respectively. However, Levene's test outcomes reveal insignificance for the convergence, because it confirms the homogeneity of variance across the two years with an *F*-statistic of 1.2283 (p = 0.3635). Therefore, it is concluded that convergence towards industry medians is not taking place for disclosure understandability.

With regards to the CER relevance, the range of relevance scores, standardised by the country- and year-specific industry medians, are seemingly broadening over time, owing to the standard deviation around median scores in 2006 being larger than that in 2005. The nonexistence of the disclosure relevance convergence, thus no mimetic behaviour in reporting relevance towards industry medians over the two-year period, is also found in the findings from the year-specific OLS regressions for relevance. That is, there is an increase in the residual variances across the 2-year period, with MS_R = 6.3772 and 77.8615 in 2005 and 2006, respectively. In relation to this, Levene's test of relevance does give robustness to firms having diverging relevance of disclosure across the years, with the *F*-statistic being 0.0578 (p = 0.0000).

In consideration of the CER reliability, a decrease in standard deviation in reliability around the median scores over the two years suggests that the range of the reliability scores standardised by country- and year-specific industry medians is narrowing over time. Moreover, the variance of the residuals from the year-specific OLS regressions of reliability decrease from 2005 to 2006 (MS_R = 0.5416 and 0.2938, respectively). Indeed, these results suggest the convergence of firms' CER reliability towards industry

medians, thus providing support for institutional theory's mimetic behaviour of firms' reporting, with Levene's test for equality of variances being 1.7410 (p = 0.0148).

The findings for comparability and consistency are similar to those for the total reporting quality. That is, the range of the comparability and consistency scores, standardised by country- and year-specific industry medians, grows over time, as shown by the standard deviation around the median scores in 2006 being greater than that in 2005. Additionally, there is an increase in residual variance across the two years, with MS_R = 0.5085 and 0.7450 in 2005 and 2006, respectively. These findings suggest that the CER comparability and consistency scores tend to diverge from industry medians over the 2-year period. However, the result from Levene's test of comparability and consistency does not give robustness to the divergence of CER comparability and consistency across the years, as there is an insignificant F-statistic of 0.7686 (p = 0.3923). Therefore, it can only be concluded that there is no convergence of reporting comparability and consistency towards industry medians, hence no mimetic behaviour in CER regarding this qualitative characteristic over the study period.

In sum, the results using Cormier et al.'s (2005) approach to test the environmental disclosure convergence through year-specific regressions are similar to those obtained from the Mann-Whitney test and one sample t-test/Wilcoxon signed-rank test, with the one exception being that for CER comparability and consistency. That is, convergence in: the total reporting quality, understandability and relevance, is not found, hence the inexistence of rigorous two-way mimicry in the firms' environmental disclosures for these facets[59], whereas reporting reliability tends to converge towards industry medians indicating the presence of strong mimetic behaviour for this aspect.

However, different results are found for reporting comparability and consistency. That is, the findings from the Mann-Whitney test and one sample t-test/Wilcoxon signed-rank test show the existence of convergence, thus mimetic behaviour, in CER comparability and consistency over the years, whilst this is not found for the year-specific OLS regressions. In this regard, the smaller sample of firms used in the latter

[59] However, the results from the Mann-Whitney test and the one sample t-test reveal mimetic behaviour regarding total CER quality towards the existing leaders' practice for the followers subsample, in particular.

than in the former[60] could contribute to these different results. Further former tests are performed using this new limited sample and there is a consistent finding that there is no convergence for CER comparability and consistency.[61] Consequently, it can be concluded that, in general, the different approaches to test for reporting convergence have yielded a similar pattern of results. Notwithstanding this similarity, the findings obtained from the former treatment can be further interpreted in accordance with coercive reporting behaviour as per institutional theory or stakeholder/legitimacy theories, because institutional theory's mimetic behaviour does not exist, which cannot be determined by the year-specific OLS regressions. Therefore, the discussion of the results in the next chapter will simply focus on those from the former approach pertaining to the Mann-Whitney and one sample t/Wilcoxon signed-rank tests.

5.5 Interrelation between Financial and Environmental Performance

With regards to the effect of financial performance on a firm's environmental performance, as per *H11.1*, the correlation matrix from the first study of the equation (6), demonstrated in table 5.4, shows that $FIN\ PERF_{jt}$ is not significantly correlated with $EMISSIONS_{jt}$. This runs contrary to the findings of Waddock and Graves (1997) and Jaggi and Freedman (1992) that a firm with high retained earnings and profits tends to be more active on environmental investments, which enhance good environmental performance.[62] However, the findings of the first study have shown that a firm's financial performance is a significant determinant of environmental reporting quality, especially in its relevance and comparability and consistency. Therefore, it can be concluded that the financial health of a firm enhances its environmentally related activities in terms of its disclosure, rather than in terms of its performance for a particular year. That is, although investment to improve environmental performance might be increased, the results cannot be seen in the same period, but may be apparent

[60] This is because of the missing data for the explanatory variables and the null values of the denominator where the comparability and consistency scores are deflated by industry medians, as discussed above.

[61] One sample t-tests for both leader and follower subsamples of ΔC_{jt} resulted in insignificance, $t = 0.8069$ ($p = 0.4332$) and $t = 0.0000$ ($p = 1.0000$), respectively. A one sample t-test rather than a Wilcoxon signed-rank test is employed since the ΔC_{jt} for each subsample of this limited sample appear to be normally distributed.

[62] However, these authors employed lagged financial performance data.

in the next one. This outcome could be due to firms not providing financial resources to improve their environmentally-related performance. Finally, according to McWilliam and Siegel's (2001) although firms might award financial resources on environmental investments leading to higher expenditure they also receive higher revenues in return for this in that particular year, thereby maintaining equilibrium and thus, preventing any possible relationship being found. However, owing to the fact that this functional vector from financial to environmental performance is not a key focus in this study, no further investigation has been performed. Therefore, it is generally concluded that firm environmental performance and profitability in a concurrent period is not related.

As discussed in chapter 3, the opposite vector of the interrelation, i.e. the effect of firm environmental performance on firm profitability, is of interest in this study, because it addresses the issue of a firm's motivations for CER as investigated in section 5.3. That is, this third study examines whether a firm's environmentally related activities, which include performance and disclosure, has value-relevance to stakeholders as per *H11.2* and equation (16). As described in section 5.1, this empirical work deals with a different period set of dependent and independent variables in the regression model to those for the first and second studies. That is, it involves a sample that is restricted from the full sample but in a different way to that used in studies one and two and the presentation and examination of these results are provided below.

5.5.1 Summary of the Descriptive Statistics

Table 5.12 shows a summary of the descriptive statistics for the dependent and explanatory variables in the regression model.

Table 5.12: Summary of the Descriptive Statistics for the Dependent and Explanatory Variables

	Country/Accounting System, $COUNTRY_{jt}$		
	UK (= 1)	US (= 0)	**Total**
Panel A: Dependent Variables			
Financial Performance, *FIN PERF*$_{jt}$			
Minimum	-17.3900	-11.7000	-17.3900
Median	24.8100	29.8900	27.3900
Maximum	201.7300	113.8600	201.7300
Mean	32.1555	31.6807	31.9442
Std. Dev.	31.3382	18.7936	26.4374
Observations	106	85	191
ANOVA, F = 0.02, p = 0.9022			
Panel B: Categorical Explanatory Variables			
Lagged GRI Guidelines Application, *GRI APP*$_{jt-1}$			
1 = GRI Guidelines Application	44	44	88
0 = Non-GRI Guidelines Application	62	41	103
Total Observations	106	85	191
χ^2 = 1.9968, p = 0.158			
Lagged Independent Environmental Ratings, *INDEX*$_{jt-1}$			
1 = FTSE4Good/DJSI US Listed	90	50	140
0 = FTSE4Good/DJSI US Non-Listed	16	35	51
Total Observations	106	85	191
χ^2 = 16.3963, p = 0.000			
Industry Sector, *INDUSTRY10*$_{jt}$			
1 = Mining, $INDMining_{jt}$	14	8	22
2 = Manufacturing, $INDManu_{jt}$	29	53	82
3 = Utilities, $INDUtilities_{jt}$	10	2	12
5 = Trade, $INDTrade_{jt}$	10	4	14
7 = Transport, $INDTransport_{jt}$	6	5	11
8 = Finance, $INDFinance_{jt}$	26	8	34
9 = Real Estate, $INDRealEstate_{jt}$	10	4	14
10 = Other Service Activities, $INDOthers_{jt}$	1	1	2
Total Observations	106	85	191
Fisher's exact p = 0.000			
Panel C: Continuous Explanatory Variables			
Lagged Environmental Performance, *EMISSIONS*$_{jt-1}$			
Minimum	-0.9253	-1.1132	-1.1132
Median	3.8726	4.1858	4.0907
Maximum	10.3903	9.1974	10.3903
Mean	4.3441	4.4666	4.3986
Std. Dev.	2.4802	1.5922	2.1269
Observations	106	85	191
ANOVA, F =0.16, p = 0.6934			
Lagged Total CER Quality, Q_{jt-1}			
Minimum	17.3195	7.7982	7.7982
Median	40.2109	32.2796	36.1523
Maximum	64.5207	61.0537	64.5207
Mean	41.9478	32.0825	37.5574
Std. Dev.	12.2801	10.9498	12.6692
Observations	106	85	191
ANOVA, F = 33.50, p = 0.0000			
Organisational Size, *SIZE*$_{jt}$ (By Natural Logarithm of Total Assets)			
Minimum	21.3718	23.2623	21.3718
Median	24.2264	24.5764	24.3959
Maximum	28.9617	28.4138	28.9617
Mean	24.6021	24.8830	24.7271
Std. Dev.	1.6302	1.1983	1.4571
Observations	106	85	191
ANOVA, F = 1.76, p = 0.1863			

Table 5.12: Summary of the Descriptive Statistics for the Dependent and Explanatory Variables (continued)

	Country/Accounting System, $COUNTRY_{jt}$		
	UK (= 1)	US (= 0)	**Total**
Lagged Financial Performance, $FIN\ PERF_{jt-1}$			
Minimum	-17.3900	6.7300	-17.3900
Median	25.6950	31.9200	30.2600
Maximum	496.1500	113.8600	496.1500
Mean	38.3821	32.7984	35.8972
Std. Dev.	55.8842	15.7044	42.9263
Observations	106	85	191
ANOVA, F = 0.80, p = 0.3730			

Pearson Correlation Coefficient

	$EMISSIONS_{jt-1}$	Q_{jt-1}	$SIZE_{jt}$	$FIN\ PERF_{jt-1}$
$EMISSIONS_{jt-1}$	1.0000			
Q_{jt-1}	0.0743	1.0000		
$SIZE_{jt}$	-0.2435**	-0.0726	1.0000	
$FIN\ PERF_{jt-1}$	0.0534	0.1951**	-0.1195*	1.0000

* denotes significant at the 10% level. ** denotes significant at the 5% level.

Panel A of table 5.12 reveals that the range of financial performance ($FIN\ PERF_{jt}$) in the UK is greater than in the US, but there is no significant difference in the mean values of $FIN\ PERF_{jt}$ between the two countries. This observation reflects the fact that the UK and the US are both similarly powerful economically.

As shown in Panel B, it is likely that multicollinearity exists since two or more categorical variables are included in the regression model. In this regard, while $GRI\ APP_{jt-1}$ is proportionately distributed between the categories of $COUNTRY_{jt}$, a greater proportion of the UK companies are listed in the lagged independent ratings index and the type of industry sector is statistically significantly dependent on a firm's country of domicile. Panel C demonstrates that there is no significant difference in the mean values of $EMISSIONS_{jt-1}$, $SIZE_{jt}$ and $FIN\ PERF_{jt-1}$. However, Q_{jt-1} is significantly greater, at the 1% level, in the UK, again representing multicollinearity of the explanatory variables. Its average values are 41.9478 among the UK firms and 32.0825 among the US firms. The former figure is more than the 50th percentile value and the latter is more than the 25th percentile value, which suggests that about 50% and 75% of firms in the UK and the US, for this more restricted sample, respectively, have moderate total information quality.

In addition, multicollinearity is also present among the continuous explanatory variables. With regards to this, the Pearson correlation in Panel C shows that Q_{jt-1} and

FIN PERF$_{jt-1}$ are positively correlated at the 5% level with a coefficient value of 0.1951. Moreover, *SIZE*$_{jt}$ is negatively related with *EMISSIONS*$_{jt-1}$ at the 5% level with a coefficient value of 0.2435. These significant correlations suggest that a firm with higher lagged profitability tends to provide greater lagged total information quality in its environmental reporting and a large firm is less likely to create environmental impact regarding greenhouse gases emissions in the previous period than a small one.

Given the presence of multicollinearity of several explanatory variables, some auxiliary regressions in order to establish the robustness of the parameter estimates are performed. The results consistently indicate a strong pattern of statistical significance and the coefficient estimates appear to be constant in this procedure. Furthermore, pooled OLS regression is performed with cluster-robust standard errors so as to control for error correlation. Multicollinearity is, therefore, considered as being immaterial for the analysis in this model.

5.5.2 Results and Analysis

As discussed in chapter 4, pooled OLS regression is considered appropriate for the data of this study, since the Breusch-Pagan Lagrange multiplier test for random effects reveals acceptance of the null hypothesis that there are no random effects. Table 5.13 reports the results of the pooled OLS regression for a firm's profitability on the related explanatory variables. Columns a and b provide the comparative results for the use of the natural logarithms of firm total assets and firm market capitalisation, respectively, as a proxy for firm size. The linear effects of environmental performance are discussed first. The firm environmental disclosure effects, the other firm environmental information effects and the impacts of other firm-specific factors will then be sequentially analysed.

Table 5.13: Regression Results

Explanatory Variables	Predicted Sign	Financial Performance, $FIN\ PERF_{jt}$	
		a	**b**
Constant		45.8281	-57.2356*
		(1.51)	(-1.87)
$EMISSIONS_{jt-1}$	-	-0.0631	-0.2612
		(-0.07)	(-0.28)
Q_{jt-1}	+	0.1248	0.0944
		(0.71)	(0.54)
$GRI\ APP_{jt-1}$	+	-0.4633	-3.8595
		(-0.14)	(-1.13)
$INDEX_{jt-1}$	+	-0.2091	-1.2033
		(-0.05)	(-0.28)
$SIZE_{jt}$ [(a)]	+	-0.7617	3.4873***
		(-0.62)	(2.81)
$INDUSTRY10_{jt}$			
$INDManu_{jt}$	±	-10.4752**	-8.6960*
		(-2.43)	(-1.88)
$INDUtilities_{jt}$	±	-10.3863**	-6.6039
		(-2.46)	(-1.43)
$INDTrade_{jt}$	±	-16.0664***	-13.8016**
		(-2.70)	(-2.04)
$INDTransport_{jt}$	±	-23.2023***	-23.5482***
		(-4.61)	(-3.75)
$INDFinance_{jt}$	±	-18.6755***	-21.1647***
		(-2.64)	(-3.40)
$INDRealEstate_{jt}$	±	-13.8911*	-12.2685*
		(-1.97)	(-1.81)
$INDOthers_{jt}$	±	-20.6262**	-18.5298**
		(-2.57)	(-2.51)
$COUNTRY_{jt}$	±	-1.9742	2.9509
		(-0.58)	(0.84)
$FIN\ PERF_{jt-1}$	+	0.3963***	0.3879***
		(4.94)	(5.05)
R^2		0.534	0.546
Adjusted R^2		0.497	0.509
F		10.49	15.77
Prob > F		0.0000	0.0000
Number of Observations		191	186

The *t*-statistics are the *t*-values adjusted for heteroskedasticity consistent standard errors.

* denotes significant at the 10% level. ** denotes significant at the 5% level. *** denotes significant at the 1% level.

(a) Columns **a** and **b** depict the models using the natural logarithms of total assets and market capitalisation, respectively, as a firm size proxy.

The Effects of Environmental Performance

The insignificant coefficient for $EMISSIONS_{jt\text{-}1}$ in table 5.13 reveals that poor lagged environmental performance appears to be immaterial to a firm's profitability and therefore, there is no evidence to support *H11.2*. This result is contrary to expectation as findings in prior studies have shown that superior environmental performance would enhance the financial rewards of a firm. For example, those of Hart and Ahuja (1996) and Jaggi and Freedman (1992) revealed a positive relationship between environmental performance and one-year and average three-year subsequent period profitability, respectively and Orlitzky et al. (2003) elicited that there is a positive relationship between environmental performance and variable period length subsequent profitability. Moreover, although the result from this study appears to be in tune with the finding of Freedman and Jaggi (1992), it is inconsistent with that of Cordeiro and Sarkis (1997), who observed a negative relationship between environmental performance and subsequent short-term financial performance. Notwithstanding this, the short period of this study could perhaps contribute to this appearance of a neutral relationship. That is, the impact of environmental performance on a firm's financial outcomes may appear with a time lag of more than one year.

The Effects of Total CER Quality, GRI Application and Independent Environmental Ratings

The lagged information quality of firm environmental disclosure is not found to be significantly influential on firm profitability. In addition, the other lagged environmentally related information regarding both reporting and performance, such as the GRI Guidelines use in the lagged CER and membership of lagged environmental indices, are not found to have an impact on a firm's profitability. Again, these findings were not predicted. Regarding the lagged information from the reporting, taken from the literature on the value-relevance of CER for financial stakeholders (e.g. Deegan and Rankin, 1997; Richardson and Welker, 2001), it was expected that a firm could also earn financial benefit from other stakeholders, if they take more action on environmental reporting. With regards to the lagged information on environmental

performance, a positive correlation between the lagged performance and profitability was expected, as discussed above. An absence of relationship between both aspects of lagged environmental information (i.e. both referring to reporting and performance) and profitability could again be down to the short period covered by the investigation.

The Effects of Firm-Specific Factors

Firm-specific factors are included as control variables.[63] With regards to this, it is found that firm size (as measured by natural logarithm of firm total assets) is not significantly influential on the variation in firm profitability.[64] In addition, it is found that there are some industry effects on a firm's financial performance. With respect to this, from least to most, firms in the utilities, manufacturing, real estate, trade, finance, other service activities and transport sectors are significantly less likely to earn greater profit than firms in mining, that is, the comparator sector.[65] As expected, a firm's lagged profitability is also found to be highly influential, but the country of domicile of a firm appears to be immaterial.

5.6 Summary

In this chapter, the results from the examination of the quality of environmental disclosures by the sample firms, using the three analytical methods developed in the previous chapter, have been presented and analysed. The first study has investigated the determinants of variation in the CER quality using appropriate regression models for the measures of each qualitative characteristic. The second has involved investigating CER behaviours, as per institutional theory, using the positive mean/median of the quality

[63] If these control variables are excluded, the results still show a similar pattern, that the lagged environmental performance, CER reporting quality, GRI Application in the reporting and membership in independent environmental ratings are all statistically insignificant.

[64] However, if the natural logarithm of a firm's market capitalisation is employed as a size proxy, size has a significantly positive effect on a firm's profitability.

[65] If the natural logarithm of a firm's market capitalisation is used as a proxy for size, for utilities sector this appears to be immaterial. Ranked from lowest to highest, firms in manufacturing, real estate, trade, other service activities, finance and transport sectors are significantly more likely to earn less profit than mining sector.

scores' difference over time and the change of the variance in the residuals over time, derived from year-specific OLS regressions. The third study has been an examination of the environmental-financial performance interrelationship, which was extended to concentrate on the value-relevance of a firm's environmental information, using a regression model.

In general, the first study employed the random-effects generalised least squares regression model to explain both the firm and the time effects for total reporting quality and measures of each qualitative characteristic, except for comparability and consistency for which pooled ordered logistic regressions were used owing to its distribution. The outcomes have revealed that several factors, i.e. sample firms' specific characteristics (e.g. industry sector, profitability, size), affects their decision making in disclosing environmental information as regards to its quality. That is, higher environmentally impacting sectors, greater profitability and larger firm size are factors that make a firm publish a better quality of environmental information. These, generally, are in tune with the findings in the extant literature and provide support for the stakeholder and legitimacy theories. Moreover, firms' country of domicile and hence, in this research the difference in financial accounting systems, also has an effect on the variation in environmental information quality. In this regard, the UK firms that employ a principles-based accounting regime appear to report more quality than the US firms that use a rules-based one.

Additionally, environmental performance, measured as the inverse of GHGs emissions volume on one million US dollars operating revenue of a firm, is conceivably another influential factor that affects environmental disclosure quality, in that, firms with greater emissions tend to disclose lower CER quality than their counterparts. Furthermore, this study's additional experimental variables, such as GRI Guidelines application and reporting year, have been found to be positively related to firms' environmental reporting quality, but no significant effect with regards to independent environmental ratings has emerged. Moreover, no effects were elicited in relation to the extent of shares-listed globally or for the existence of worldwide operations. Regarding the latter outcome, this shows that having a greater amount of stakeholders based abroad does not

have any impact on quality.[66] However, when the qualitative components are taken into consideration, these variable effects on the environmental disclosure quality are different across all four.

The results of the second study that tested CER behaviours as per institutional theory, employing the positive mean/median of the quality scores differences over time, have provided support for industry leaders' mimetic mode of reporting, with regards to the: total CER quality, reliability and comparability and consistency qualitative components. For the other two measures of the qualitative characteristics, i.e. understandability and relevance, the findings appear to be consistent with institutional theory's coercive behaviour and stakeholder/legitimacy theories, respectively. The outcomes for the difference in the variances of the residuals from the year-specific OLS regressions, with the normalisation of the quality scores by the firms' country- and year-specific industry median scores as the dependent variables, have generally shown robustness for the convergence scores, thus emphasising the existence of leaders' mimetic activity found in the first approach for this particular study. In this regard, referring to the total CER quality, although the overall reporting convergence is consistently absent in the results from using both treatments, the findings from the first procedure have indicated that an upward movement does explicitly show for the follower subsamples and this suggests the existence of industry leaders' mimetic behaviour, as concluded above.

The final empirical investigation concentrated on the interrelation between financial capability and environmental performance. With regards to the first part of the vector, inconsistent with the previous studies that have been based on resources driven analysis, the correlation outcomes of the first study's regressions have revealed that the concurrent period of financial resources is not significantly influential on whether a firm performs efficiently environmentally. When considering the opposite vector of the interrelationship, the results show no impact of firms' environmental efficiency, both in terms of action and of disclosure, on the subsequent period profitability. Contrary to expectation, this suggests the irrelevance of environmental information to stakeholders other than the financial ones.

[66] With the exception of one regarding the international operation on the reporting relevance, which showed a negative influence.

6 Discussion of the Results

Drawing upon the devised CER quality framework, the hypotheses established in chapter 3, as summarised in the table 6.1 below, have been tested using the three analytical procedures with the results being reported in the previous chapter. In this chapter, there is detailed discussion of these outcomes in relation to existing theories to establish whether the quality framework delivers validity and whether it is more robust than other approaches to measuring environmental disclosure. Each hypothesis is considered from the perspective of total disclosure quality as well as the four identified components.

This chapter is organised as follows. The observed variation in the measures of each qualitative characteristic is discussed in section 6.1. Section 6.2 presents a discussion of the outcomes of the first empirical investigation pertaining to the determinants of variation in CER quality. The empirical results of the second study that tested the CER behaviours using institutional theory is subsequently considered in section 6.3. Section 6.4 contains a discussion of the results of the final empirical strategy that dealt with the interrelationship between environmental and financial performance. There follows a synthesis of the results as well as consideration of their potential implications in section 6.5.

Table 6.1: Summary of Hypotheses Tested

Hypothesis	Statement of Hypothesis
CER Quality:	
H1.1	The levels of usage of each qualitative characteristic: understandability, relevance, reliability and comparability and consistency are substantially different in CER and although there is correlation between each of these characteristics it is imperfect.
H1.2	The four characteristics are positively correlated.
Determinants of Variation in CER Quality:	
H2	The higher the quality of CER, the larger the company.
H3	The quality of CER is higher in industries associated with prominent environmental issues.
H4.1	The quality of CER is higher if the company has domicile in a country that: has high levels of environmental consciousness, is more exposed to environmental concerns, and has less of a legislative preference.
H4.2	The quality of CER is higher if the company has shares listed in another country(ies) apart from its country of domicile.
H4.3	The quality of CER is higher if the company has substantially operated (generated

Table 6.1: Summary of Hypotheses Tested (continued)

Hypothesis	Statement of Hypothesis
	revenue, gained operational profit, or held net assets) abroad.
H5	The higher the quality of the CER, the more profitable the company.
H6	The higher the quality of CER, the better a company's environmental performance.
H7	The quality of CER is higher if the company has domicile in a country that mainly uses a principles-based financial accounting system (the UK) than in a country that mainly uses a rules-based financial accounting system (the US).
H8	The quality of CER is higher if a company applies the GRI Guidelines as their environmental disclosure discipline.
H9	The quality of CER is positively correlated with that measured from independent rating organisations.
H10	The quality of CER is positively correlated with reporting year.
Tests of CER Behaviours under Institutional Theory:	
H10.1	The company quality of CER is positively correlated with that in the previous year as well as that of benchmark companies in the industry in the previous year, across the study period.
H10.2	The company quality of CER is positively correlated with that in the previous year as well as the degree of a discrepancy between that in the previous year and that of benchmark companies in the industry in the previous year, across the study period.
The Interrelation between Financial and Environmental Performance:	
H11.1	Environmental performance is better, the greater the profitability of the firm.
H11.2	The greater the financial performance, the better a company's environmental performance and/or its CER quality.

6.1 CER Quality (Hypotheses 1.1 and 1.2)

Regarding the components of disclosure quality, in practice, the level of usage of each measure of these characteristics by sample companies in their environmental disclosures is different, but they have all been found to be positively correlated, if only imperfectly (in support of *H1.1* and *H1.2*). That is, these levels of usage outcomes are observed as being unbalanced, but they do all move in the same direction. This observation basically implies that the CER framework derived from the financial reporting frameworks, i.e. defined by the four characteristics of decision-useful information as developed in this research, is valid and eligible to be subsequently employed in further empirical studies to elicit whether the measures of these characteristics enable better understanding of reporting behaviour, based on the existing theories. Regarding the actual scores, the understandability and relevance characteristics have exhibited the highest and lowest for the sample firms, respectively.

6.2 Determinants of Variation in CER Quality (Hypotheses 2 – 10)

Referring to the first study in chapter 5, which involved investigating the stakeholder and legitimacy theory perspectives on firm behaviour, in summary, the regression results for overall/total quality show that several factors (for example, firm specific characteristics of industry sector, size and profitability) are significant determinants of variation in disclosure, which is consistent with previous studies dealing with other measures of reporting quality and volume. In addition, the country characteristic of difference in the firms' accounting system for the UK and the US is also found to be influential, and this contributes further to research on the quality of CER. Furthermore, the alternative empirical proxy for environmental performance to those employed in previous literature, as discussed in earlier chapters, i.e. GHGs emissions levels, is found to be a highly negatively significant determinant of total environmental reporting quality. The study's additional experimental variables, such as GRI application and time, also have power in terms of explaining a firm's environmental disclosure. The other two firm characteristics relating to country (cross-listing of shares and proportion of sales revenue outside a firm's home region) and membership of independent environmental ratings appear to be immaterial.

With respect to the measures of each qualitative characteristic of environmental disclosure, there is variability among these component measures in terms of their respective relationships with the explanatory variables, which in general suggests that these four components are used unequally. In addition, although the results show some differences across the qualitative components, they also present some similarities. In this regard, for all four components a highly significant effect is that of a firm's industry sector, but there is slightly different pattern of influence amongst the four. Moreover, there is no significant effect of listing in independent environmental ratings or for cross-listing of shares, in all the regression results for the four measures. Next, first, there is discussion on the effects of the explanatory variables and their theoretical implications in terms of the total CER quality and this is followed by detailed consideration of the variation amongst the measures of each qualitative characteristic.

6.2.1 Predictors of Total CER Quality

In this subsection on total disclosure quality the evidence for the relevant hypotheses are drawn upon, as summarised in table 6.2 below.

Table 6.2: Total CER Quality Hypotheses Test Results

Hypothesis	Explanatory Variables	Results	Supported?
H2	Size	A weakly significant and positive impact is found for total reporting quality, implying that larger firms tend to produce higher quality of environmental information disclosures.	Possibly indicated (at the 10% level)
H3	Industry sector	Disclosure quality is higher in companies in sectors with higher environmental sensitivity and vice versa. Moreover, the real estate and the other service activities sectors are associated with low quality reporting, as is, but to a higher degree, the finance sector. Comparison of the coefficients of the real estate sector with the transport [(a)], utilities and manufacturing sectors suggests that the total quality is more impaired in the foremost.	Yes
H4.1	Country of domicile	Total disclosure quality is likely to be high if a firm is domiciled in the UK.	Yes
H4.2	Cross-listing of shares	The findings reveal that the extent of share ownership is not considered to be an important factor affecting environmental reporting decisions, in terms of its quality, for the sample firms.	No
H4.3	Proportion of sales revenue outside a firm's home region	The results demonstrate that the extent of sales revenue outside a firm's home region, i.e. the level of the potential stakeholder based overseas, is not influential on total reporting quality.	No
H5	Financial performance (as measured by profitability)	A highly positive relation between profitability and environmental disclosure quality is found.	Yes
H6	Environmental performance	The results reveal that higher quality disclosure is associated with better environmental performance. That is, negative coefficients on $EMISSIONS_{jt}$ show a highly significantly negative relationship between them and the total quality of CER, as shown in table 5.6 of the previous chapter.	Yes
H7	Accounting system (as represented by country of domicile)	The results suggest that the quality of environmental disclosure is influenced by the accounting system of the firm's country of domicile. That is, controlling for the other factors, UK firms that use a principles-based accounting system appear to report with higher total quality of CER.	Yes

Table 6.2: Total CER Quality Hypotheses Test Results (continued)

Hypothesis	Explanatory Variables	Results	Supported?
H8	GRI Guidelines application	GRI Guidelines application in a firm's environmental disclosure has been found to increase the likelihood that it provides high quality of environmental disclosure, although its explanatory power is much lower than that for the: sectoral, country and hence, reporting system, financial performance and environmental performance factors.	Yes
H9	Independent environmental ratings	The findings suggest that for total CER quality the likelihood of disclosure is not affected by a firm's listing in independent environmental ratings.	No
H10	Year	The findings report the likelihood that disclosure quality is increasing with year of reporting, although its explanatory power is much lower than that for the: sectoral, country and hence, reporting system, financial performance and environmental performance variables.	Yes

(a) Amongst the results, only for this sector is the coefficient insufficient to demonstrate its sectoral difference at the 5% confidence limit, but it is within the 10% level, hence although this outcome is not conclusive it is still indicative.

Stakeholder Theory Perspective

Hypotheses 2, 3 and 5

Apart from the financial reporting regime distinction, the US and the UK have similar stakeholder configurations and hence the findings regarding stakeholders cannot be robustly compared with work by Adams and Kuasirikun (2000), Gamble et al. (1996) and van der Laan Smith et al. (2005), who deliberately chose to investigate contrasting stakeholder set ups. It is possible to postulate, however, given these findings, that the firms' provision of environmental disclosure is subject to societal pressures from affected or concerned stakeholders. Regarding this, a pattern has emerged across industry sectors in terms of how environmental impact and stakeholder demand impact on the level of quality of environmental disclosures. That is, it has been found that environmentally sensitive industries produce higher levels than their counterparts. More specifically, firms in sectors most closely related with environmental concerns,

including: mining, transport[67], utilities and manufacturing, are driven to make higher quality environmental reports than those in sectors that have less environmental pressures (i.e. real estate, other service activities and finance).

In addition, stakeholder influence has appeared when firms perform financially well and when firm size is large in that they appear to require more information on the general level of the social and/or environmental responsibility of the business in question than is the case for other firms. This result was expected, because previous studies, e.g. Gray et al. (2001) for both outcomes and Brammer and Pavelin (2006a) for only the latter, have discovered that these factors represent a firm's level of public visibility, bringing with it the expectation of increased disclosure from stakeholders and hence, the outcomes from this research provide more evidence in support of stakeholder theory. Alternatively, the effect regarding a firm's financial robustness could be because this signals the availability of internal resources to support such reporting, as the firm perceives that the public expects them to do so, as suggested by Cormier and Magnan (1999) and Roberts (1992). However, here, the effect of the size variable is at the 10% level of confidence which is only an indicative rather than a conclusive result. That is, the explanatory power of this variable is very much lower than those for the aforementioned industry sector and financial performance factors. Its explanatory power is also very much lower than those for the country of domicile and hence, reporting system, environmental performance, GRI application and year, factors discussed further below.

Hypotheses 4.2 and 4.3

In relation to the last two explanatory variables that can reveal stakeholder involvement, namely, cross-listing of shares and proportion of sales revenue outside the home region, no significant link with total disclosure quality has been elicited. Regarding the former, this is rather contrary to the proposition of stakeholder theory, where the effect of wider ownership on environmental disclosure activism, as can occur in these circumstances, was expected to lead to increased disclosure (Cormier et al., 2005[68]; Ullmann, 1985).

[67] This is indicated at the 10% level.

[68] The empirical results of Cormier et al. (2005) showed a negative relationship between foreign ownership and the extent of environmental disclosure and these authors considered that was to be

However, the findings are similar to those of Brammer and Pavelin (2006a) and Roberts (1992), although they employed a different proxy for measuring the level of stakeholder interest, i.e. the dispersion of share ownership. An explanation for the absence of such an effect in this research is that it is possible that firms do not make a connection between having wider ownership and the need to disclose information, other than that financially related to them. Thus, it can be surmised that a firm is more likely to react to external threats from, for example, environmental activists, customers, suppliers and governmental agencies, than to an internal type of stakeholder, such as its shareholders. In other words, this outcome would appear to support the legitimacy theory perspective that firms only take action when they perceive a threat to their legitimacy and not stakeholder theory, because although cross-listing increases the stakeholder base (wider shareholder base) no relation is found with disclosure quality level, a matter returned to when other variables are considered below. In relation to the proportion of sales revenue outside the home region, the lack of association with disclosure quality signifies that firms do not use voluntary reporting in any significant way to cater for the needs of foreign stakeholders. Therefore, given the findings with regards to: environmental sensitivity, high profitability and large size, it would appear that the CER of firms with these features is largely geared towards local non-financial stakeholders.

In sum, given the inconsequentiality of these two variables, it would appear that stakeholder theory cannot robustly explain variation in disclosure quality. Therefore, the observed reporting practices need to be considered from a different theoretical basis, yet still one involving socio-political pressures, namely, legitimacy theory. That is, the next step is to investigate whether environmental disclosure quality is conditioned by a firm's legitimisation efforts, rather than in response to its stakeholders.

Legitimacy Theory Perspective

Hypotheses 2, 3 and 5: Keeping the Public Informed and/or Changing Perceptions

---

expected, because their sample firms were in Germany, which they argued have higher environmental concerns than in many other countries. However, this is not the case in the contexts of this research and thus a positive relationship was predicted.

The above explanation of stakeholder theory regarding the societal pressures on the firms can also be interpreted in tune with legitimacy theory, in that environmental disclosure may be used by companies as a legitimating measure. That is, when firms exhibit the aforementioned trigger characteristics for higher levels of environmental disclosure quality, they can be seen as acting to gain or maintain their legitimacy by providing these. More specifically, the positive link between environmentally sensitive industries, profitability and size and disclosure quality, indicates that there is a tendency for firms possessing these features, which pertain to high exposure, to adopt a legitimising strategy in the form of an increased reactive response to resolve any negative public response to their activities. Recall that under legitimacy theory Lindblom (1994) suggested that social and/or environmental reporting may be used as a firm's reactive legitimising device to inform the stakeholder groups about its performance and activities (first strategy) and/or to change the public's perceptions regarding its performance so as to encourage society that it is competent to manage difficult issues (second strategy), thereby narrowing a legitimacy gap. Consequently, these outcomes on the orientation of disclosure quality accord much more closely with Lindblom's first and/or second legitimising strategies than the third or fourth, where a negative relation would be expected.

Hypothesis 6: Distracting Attention

Further, the results indicate the presence of a legitimacy-threatening effect on CER total quality that is particularly pronounced where there are high levels of GHGs emissions, i.e. poor efficiency of environmental performance. That is, when environmental performance is inferior, as reflected in high emissions levels, a firm avoids any possible legitimacy loss through its stakeholders' perceptions, by not providing robust informational quality in the CER. In contrast, a firm with good environmental performance seeks to gain legitimacy through publicising its favourable performance in the form of high quality disclosure. This result is consistent with previous empirical studies (e.g. Al-Tuwaijri et al., 2004; Clarkson et al., 2008), reflecting a proactive legitimating strategy based on legitimacy theory (Lindblom, 1994). More specifically, this would fit into Lindblom's third strategy of distracting attention from negative matters through a process of providing other subject matter or stressing past actions, in

lieu of providing good quality material, so as to prevent a legitimacy gap. That is, these outcomes support the view that legitimacy-threatening effects drive the decisions on environmental disclosure quality, because they suggest that poorer levels on emissions are delivered so that bad news can be hidden.

However, the results are inconsistent with Brammer and Pavelin (2006a, 2006b), Hughes et al. (2001) and Patten (2002a), who also claimed their outcomes can be explained under the legitimacy theory. That is, in these cases it was argued that firms with unfavourable environmental performance are at the centre of stakeholder criticism and that the legitimacy-threatening aspect comes from information concealing, which thus leads to CER being used as a reactive strategy to narrow any legitimacy gap (Lindblom, 1994). Under this line of reasoning, firms are more likely to make an extra effort to disclose environmental information extensively so as to limit any damage to the corporate image from later destructive revelations by other parties.

Moreover, unlike the prior studies, e.g. that of Brammer and Pavelin (2006a, 2006b), which used a firm's record of environmental fines to identify deficient environmental performance, in this empirical study the level of environmental performance is taken as the inverse measure of the most commonly reported GHGs emissions on one million US dollars operating revenue of a firm. This measure takes into consideration an environmental externality that is not entirely accounted for in financial reporting, whereas fines are fully internalised. Moreover, fines are levied on the basis of perceived transgressions rather than actual performance, which may be subject to bias, whereas GHGs involve direct reports by firms to a third party, which can be challenged if not trusted and so generally are more representative of performance. This would suggest that future analysis should take account of the externalised environmental effects when measuring environmental performance of a firm to obtain a fuller understanding of its effect on reporting and to improve the degree of accuracy of the outcomes. In sum, on balance, the evidence here indicates that the effect of increasing emissions level on the quality of CER is in accordance with the proactive approach aimed at preventing a legitimacy gap.

Accounting System (as Represented by Country of Domicile)

Hypotheses 4.1 and 7

Inter-country variability in environmental reporting practices is evident in the research outcomes, although the UK and the US are seemingly comparable in terms of: societal expectations regarding environmental responsibility, developed capital markets and well established environmental regulations. This distinction can perhaps be explained by the difference in national cultures between the two countries, i.e. the magnitudes of individualism/collectivism that influence the legislative orientations emphasis. In particular, prior studies (e.g. Buhr and Freedman, 2001; Ho and Taylor, 2007; Holland and Boon Foo, 2003) have suggested that a country with a more collectivistic orientation and hence, a less litigious society, as opposed to one with a more individualistic nature, is likely to be one with firms providing more environmental activism, including higher levels of disclosures. In this study, the findings from the regression analysis have provided evidence that UK firms, in a setting with a low level legislative emphasis, provide more informational quality in their CER in a proactive way than US firms with a more litigious environment. This can be interpreted as that the US firms are seen as giving CER only as a reactive response, thus suggesting that they may be reluctant to produce more informational quality than the requirements: "as certain information can provide fuel for a lawsuit" (Buhr and Freedman, 2001, p.312). This is consistent with Gray et al.'s (1990, p.599) assertion that the more litigious US environment leads "to a hesitancy to disclose information on a voluntary basis". Consequently, it is concluded that the UK's less legislative orientation, with its society exhibiting a more collectivistic nature than that of the US, encourages enhancement of environmental disclosure quality.

In fact, the results could be seen as being consistent with the observation of Adams and Kuasirikun (2000), who found greater social and/or environmental disclosure by German firms than for UK firms. However, their interpretation for the observed variation that the greater the extent of regulations demanding ethical responsibility then the more the disclosure, cannot be applied in this study, because both the UK and the

US appear to have similar laws and requirements for environmental responsibility and disclosures.

The difference can also be related to the difference in the systems for financial disclosures, that is, the financial reporting regime influences non-financial voluntary reporting practices. As discussed in chapter 3, both the UK and the US have similar environmental disclosure rules and requirements for information which are internalised into their financial reporting. However, when it comes to non-financial environmental information, neither country has any compulsory requirements and the issue here is whether the financial reporting procedure has an impact on the nature and extent of this non-financial reporting. Strong support confirming this influence is found here in that the quality of disclosure is higher for UK firms with a principles-based accounting system than US firms with a rules-based one. As to why the latter reports lower levels of non-financial quality, it is posited that given they are governed by a set procedure for financial reporting, they transfer this culture of only giving information on that which is required to this aspect, which hence delivers low responses. By contrast, under the UK's principles-based system, because there is no set procedure, they, for whatever reason, are more willing to disclose a higher quality, i.e. not being confined to a set behaviour of minimal disclosure. In sum, these results extend understanding of the influence of factors on corporate voluntary environmental reporting practices, because the evidence that such practices are subject to the nature of the general financial accounting system is confirmed.

Although in the main the results have called attention to the accounting system as being a vital factor driving firms to report non-financial environmental information varyingly, in terms of the reporting quality, the findings are not consistent with the voluntary financial information studies of Beattie and Jones (1997) and Beattie and McInnes (2006), for they found contrasting evidence that the rules-based reporting regime of the US enhances a higher level of voluntary financial information disclosures than the principles-based one of the UK. One plausible explanation for this is as follows. Under a rules-based system, in order to ensure that all bases have been covered and thus avoid any sanction for misinterpreting rules, extra voluntary financial information is delivered, whereas under a principles-based regime, provided these have been followed there is not such great pressure to proffer that which has not been stipulated or alluded

to in the text. On the other hand, for non-financial reporting, rules-based countries not only conform to minimal disclosure, because of the inherent attitude of having rules, as explained above, but also to avoid offering information that could be seen as putting the firm in a negative light. However, in principles-based regimes, because they are less prescriptive, they do not engender the same level of threat for transgressions as under a rules-based regime and hence firms are more willing to disclose higher quality environmental information.

Nevertheless, despite the UK firms producing higher informational quality than the US, this would appear to be by no means adequate given that the average total quality scores have been found to be approximately 30 per cent of those possible. Moreover, several firms in the mining, utilities and finance sectors have been producing completely incomparable and inconsistent reports. Further, firms in the manufacturing sector provided the lowest total reporting quality scores, with a mean value of 35.0945 for the restricted sample, whereas firms in the construction sector gave the lowest total reporting quality scores, with a mean value of 18.0580 for the full sample.

Other Explanations

Hypotheses 8 and 10

Further explanations for the variation in environmental disclosure quality have been offered by some of the additional experimental factors, i.e. the use of the GRI Guidelines in CER and the reporting year, although their explanatory power is much lower than that for previous ones, the: country and hence, reporting system, sectoral, financial performance and environmental performance variables. Regarding the GRI Guidelines usage, the significantly greater quality of disclosure in the firms employing them in some form is attributable to the general competence of the Guidelines, per se, since they are generally designed to provide users with complete, transparent and consistent reporting from firms on a broad range of social and environmental issues.

Considering the effect of the reporting year on the CER quality, the differences in disclosure practices are perhaps due to some of the developments in institutional factors in 2006. These include the narrative reporting requirements on environmental matters, employee and social/community issues as per s.417 of the Act (Great Britain. *Companies Act 2006*)[69], the DEFRA Reporting Guidelines for UK Business (DEFRA, 2006), the UK *Environmental Protection The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2006*, the revised EU Waste Framework Directive (Directive 2006/12/EC), the latest non-mandatory sustainability reporting guidelines, at the commencement of the study, called G3 (GRI, 2006b) and the call on S&P500 companies for better disclosure on social and environmental challenges from major institutional investors subsequent to the G3 (Ceres[70], 2006). In addition, there is the Global Framework for Climate Risk Disclosure, which is a reporting framework for disclosure of the financial risks associated with climate change put forward by collaborating organisations including Ceres and the CDP and existing investor groups focussed on climate changes, such as the Institutional Investors Group on Climate Change (IIGCC), the Investor Network on Climate Risk (INCR) and several other US based institutional investors (United Nations Environmental Programme (UNEP), 2006). Regarding these developments, firms from both of the focal countries exhibited a growth in total CER quality between the years 2005 and 2006 and any of them could have had an impact on the quality of environmental reporting. However, whether better guidance or compulsion has had the greater impact is beyond the scope of this research.

Hypothesis 9

The belief that environmental disclosure is proactively used by companies to achieve their legitimacy as a result of being members of an external environmental rating (see for example, Clarkson et al., 2008; van Standen and Hooks, 2007) is not borne out by the study outcomes. This lack of a relationship could be attributable to the following

[69] Although the act was introduced and a small portion of it received Royal Assent in November 2006, that relating to environmental matters disclosure only entered into effect in October 2007. Hence, it is unlikely that much of any increase in CER quality in 2006 was due to the introduction of this act.

[70] Ceres is a non-governmental organisation dedicated to environmental sustainability, based in the US.

reasons. Firstly, there are different methods in terms of the assessment criteria, weightings and information sources amongst the sustainability indices employed in this research (i.e. independent environmental ratings of a firm's home country: the FTSE4Good UK for the UK firms and the DJSI United States for the US firms) and unfortunately, their detailed methods are not available to public. Consequently, this may have affected the results in terms of the ratings consistency. However, as discussed in the previous chapter, this could not be avoided if both countries were still to be investigated, because the use of a single index would have compromised the research outcomes owing to the limited size of the sample. Secondly, the inclusion of economic and social matters in the assessment criteria for both external ratings may have resulted in this lack of a relationship, because some poor environmental performers still qualified for membership owing to their strong performance in these other aspects.

Summary

In sum, leaving aside the national cultures, the financial accounting system, the GRI Guidelines usage and year effects, the observed reporting practices regarding the quality predominantly purport a legitimacy theory linked explanation, whereby firms adopt both reactive and proactive stances that involve keeping the public informed, changing perceptions or distracting attention strategies. The first two of these strategies somewhat overlap with stakeholder theory in that the positive link between environmentally sensitive industry, profitability and size with disclosure quality, indicate that there is tendency for firms possessing these features to address a set of specific concerns material to stakeholders. However, at this level of analysis, given that there is no evidence to support the influence of the cross-listing of shares and the proportion of sales revenue outside a firm's home region, stakeholder theory does not robustly explain the variation in the disclosure quality and hence, it has less explanatory power than legitimacy theory.

6.2.2 Predictors of the Four Qualitative Characteristics of CER

Turning to each of the qualitative characteristics, the evidence for the hypotheses in relation to them, as summarised in table 6.3, reveals that there is substantial variation in the impact of the explanatory variables on their level of significance and the theoretical implications of this are explained in detail below.

Table 6.3: Hypotheses Testing Results for the Four Components of CER Quality

Hypothesis	Explanatory Variables	Results	Supported?			
			Understand-ability	Relevance	Reliability	Comparability and Consistency
H2	Size	A highly significant and positive impact is only found for disclosure reliability, thus implying that larger firms tend to produce more reliable environmental information disclosures.	No	No	Yes	No
H3	Industry sector	The magnitude of the industry effect on the four components of disclosure quality varies across the industry sectors. In general, disclosure quality is higher in companies in sectors with higher environmental sensitivity and vice versa. For example, companies in the non-environmentally sensitive finance sector appear to report with lesser amount of quality in their environmental disclosures, in particular in terms of relevance and comparability and consistency. Moreover, the real estate sector is associated with low quality reporting, especially in relation to comparability and consistency, as is, but to a higher degree, the finance sector. Furthermore, firms in the transport sector, considered as being an environmental impact creator, are found to provide higher relevance disclosures than those in the less environmentally-sensitive sectors, such as the finance and other service activities sectors, but to a lesser degree than those in mining, which is also an environmentally-sensitive sector. Additionally, the results show that the trade sector is weakly significantly associated with low disclosure reliability compared to the mining sector, when the natural logarithm of total assets is used as a proxy for firm size in the model. Moreover, if the natural	No (the results show an opposite direction of the relation)	Yes	Yes	Yes (except for the trade sector)

Table 6.3: Hypotheses Testing Results for the Four Components of CER Quality (continued)

Hypothesis	Explanatory Variables	Results	Supported?			
			Understand-ability	Relevance	Reliability	Comparability and Consistency
		logarithm of market capitalisation is used as a proxy for size, then the trade sector is highly associated with low disclosure reliability, as is, but to a lesser degree, the manufacturing sector. In contrast to expectation, the trade sector, a seemingly non-environmentally sensitive sector, is strongly associated with high comparability and consistency in environmental disclosures. In this regard, the positive coefficient for the sector in the results for the comparability and consistency component shows a significant likelihood that the firms in the sector are environmental information publishers that produce more superior CER regarding this aspect, compared to the other sectors. With regards to the disclosure understandability, the pattern of the sectoral results contrasts with those for the other quality characteristics. That is, firms in the other service activities sector are significantly more likely to disclose understandable CER than firms in the mining sector. Regarding this, its explanatory power is much lower than that for the country and hence, reporting system, factor.				
H4.1	Country of domicile	For all components of the CER quality, except for comparability and consistency, disclosure quality is likely to be high if a firm is domiciled in the UK. As for the disclosure relevance, its explanatory power is much lower than that for the: sectoral and proportion of	Yes	Yes	Yes	No

Table 6.3: Hypotheses Testing Results for the Four Components of CER Quality (continued)

Hypothesis	Explanatory Variables	Results	Supported?			
			Understand-ability	Relevance	Reliability	Comparability and Consistency
		sales revenue outside a firm's home region variables.				
H4.2	Cross-listing of shares	The findings for all types of reporting quality reveal that the extent of share ownership is not considered to be an important factor affecting environmental reporting decisions, in terms of quality, for the sample firms.	No	No	No	No
H4.3	Proportion of sales revenue outside a firm's home region	The results demonstrate that the extent of sales revenue outside a firm's home region, i.e. the extent of the potential stakeholders based overseas, is only influential on disclosure relevance. However, contrary to expectation, a highly negative rather than a positive impact is found for CER relevance.	No	No (the results show an opposite direction of the relation)	No	No
H5	Financial performance (as measured by profitability)	The results illustrate the importance of a firm's financial performance in providing environmental disclosure quality, with the exception being those for understandability and reliability. That is, a highly positive relation between profitability and disclosure relevance as well as a weakly positive relation between profitability and disclosure comparability and consistency, are found. As for the disclosure relevance, its explanatory power is much lower than that for the: sectoral and proportion of sales revenue outside a firm's home region variables.	No	Yes	No	Possibly indicated (at the 10% level)
H6	Environmental	The results reveal that higher quality disclosure is associated with	Yes	No	No	Yes

Table 6.3: Hypotheses Testing Results for the Four Components of CER Quality (continued)

Hypothesis	Explanatory Variables	Results	Supported?			
			Understand-ability	Relevance	Reliability	Comparability and Consistency
	performance	better environmental performance, except in the case of the relevance and reliability measures. That is, negative coefficients on $EMISSIONS_{jt}$ showed a highly significantly negative relationship between emissions and the quality of CER, except for relevance and reliability, as shown in table 5.6 of the previous chapter. As for the disclosure understandability, its explanatory power is much lower than that for the country and hence, reporting system, variable.				
H7	Accounting system (as represented by country of domicile)	The results suggest that the quality of environmental disclosure, except for comparability and consistency, is influenced by the accounting system of the firm's country of domicile. That is, controlling for the other factors, UK firms that use a principles-based accounting system appear to report with higher understandability, relevance and reliability. As for the disclosure relevance, its explanatory power is much lower than that for the: industry sector and proportion of sales revenue outside a firm's home region variables.	Yes	Yes	Yes	No
H8	GRI Guidelines application	GRI Guidelines application in a firm's environmental disclosure has been found to increase the likelihood that it provides high quality of environmental disclosure, in particular regarding its relevance. Regarding this, its explanatory power is much lower than that for the: sectoral and proportion of sales revenue outside a firm's home region variables.	No	Yes	No	No

Table 6.3: Hypotheses Testing Results for the Four Components of CER Quality (continued)

Hypothesis	Explanatory Variables	Results	Supported?			
			Understand-ability	Relevance	Reliability	Comparability and Consistency
H9	Independent environmental ratings	The findings suggest that for all four components the likelihood of disclosure is not affected by a firm's listing in independent environmental ratings.	No	No	No	No
H10	Year	The findings report the likelihood that disclosure quality, especially the relevance [(a)] and comparability and consistency components, is improving with year of reporting. Regarding the results for the latter, its explanatory power is much lower than that for the environmental performance and industry sector factors.	No	Possibly indicated (at the 10% level)	No	Yes

(a) This refers to the model where the natural logarithm of total assets is used as a size proxy and $YEAR_{jt}$ is statistically significant at the 10% level. When the natural logarithm of market capitalisation is used as the proxy, it fails to reach statistical significance ($p = 0.118$).

Stakeholder Theory Perspective

Hypotheses 2, 3 and 5

In general, with the exception of understandability, the industry effect has shown an impact for each qualitative component in an ordered pattern and this pattern supports the implication under the stakeholder theory that cross-sector variation in environmental disclosures can be explained by public perception of the sectoral environmental sensitivity. That is, the higher disclosure relevance, reliability and comparability and consistency in those sectors most likely to be criticised on environmental issues are seen as addressing the concerns of stakeholders.

The highest comparability and consistency disclosures being found in firms in the trade sector, a seemingly non-environmentally sensitive sector, might reflect the fact that this sector is intensely involved in logistics and hence, its firms are aware of their indirect environmental impact and possible public pressures. Therefore, they choose to provide a better quality of environmental information, particularly in terms of comparability and consistency, to any concerned stakeholders. In addition, stakeholder influence due to the firms' greater visibility to the public than their counterparts, regarding size and financial performance, has appeared on certain qualitative components of environmental disclosure. That is, firm size turns out to have an impact on reliability and financial success shapes relevance as well as comparability and consistency, but the latter only very weakly. Regarding these outcomes, it is notable that the other three characteristics, namely, understandability, relevance and comparability and consistency are not linked to firm size and that firms with greater profitability recognise their possible public expectations and so provide more information, but do not necessarily pay much attention to how comprehensible and trustworthy it is. Finally, there is no evidence in any of the results for these variables representing stakeholder pressure that understandability is one of the concerns.

Hypotheses 4.2 and 4.3

As with the total disclosure quality, the stakeholder theory lens for the quality components is not supported by the observed outcomes for cross-listing of shares and proportion of sales revenue outside the home region factors. More specifically, the insignificance of the former for all types of reporting quality reveals that the extent of share ownership, representing the extent of financial stakeholders, is not influential on CER decisions regarding its quality and hence, as previously mentioned in the subsection 6.2.1 for the total CER quality, this outcome would appear to support the legitimacy theory perspective. In addition, although inter-operational variability of disclosure relevance is evident, there is no pattern in this variability that would suggest a stakeholder theory explanation.

In sum, given the triviality of these two factors for stakeholder theory implications, the ineffectiveness of this theory for this analysis has emerged. As a consequence, legitimacy theory is drawn upon again to provide a more robust explanation of these results.

Legitimacy Theory Perspective

Hypotheses 2, 3 and 5: Keeping the Public Informed and/or Changing Perceptions and Distracting Attention

As with the total quality, the above stakeholder-linked explanation on the relevance, reliability and comparability and consistency of the firms' environmental disclosures can also be interpreted in accordance with legitimacy theory. That is, firms with the trigger characteristics for higher levels of CER quality, namely, environmentally sensitive industry, large size and high profitability, are aware of their exposure to the public and hence, they decide to adopt a reactive approach to manage or restore their legitimacy by providing disclosure with higher levels of certain qualitative components, depending on the perceived functionality of each (Lindblom's (1994) first and second strategies).

In addition, the different pattern of the results as regards to the industry effects on environmental disclosure understandability indicates spotlight avoidance as per legitimacy theory (Lindblom's third strategy). That is, firms with higher environmental impact may attempt to divert public attention from difficult matters to prevent their being public scrutiny that could lead to delegitimisation for producing incompetent CER. Firms with a lesser impact on the environment, on the other hand, tend to make every effort in giving clear explanations on their performance, which may include graphs, pictures or tabular presentation formats, to promote themselves as being environmentally responsible and hence, protecting their legitimacy. Furthermore, the absence of a stakeholder pressure effect regarding firm size and profitability on reporting understandability, i.e. larger firms or profitable firms do not produce more understandable CER as a response to higher stakeholder pressure, is conceivably because a similar legitimisation strategy is applied.

Hypothesis 4.3: Distracting Attention

The negative influence of the proportion of sales revenue outside the home region on CER relevance found in this study can also be explained by the distracting of attention strategy under the legitimacy theory lens. That is, a firm with a greater spatial distribution of its foreign stakeholders is less likely to make its environmental reporting relevant. The explanation for this could be that they may feel more sensitive to public scrutiny owing to the greater exposure and hence, put more information than their counterparts as a means of maintaining legitimacy, regardless of its relevance or they publish irrelevant information to hide bad news so as to avert attention away from problematic areas (Lindblom, 1994).

Hypothesis 6: Distracting Attention

With the exception of relevance and reliability, the qualitative components of environmental disclosure are also conditioned by a firm's legitimisation effort. Regarding this, this study presents robust evidence showing that good environmental performers disclose more informational quality, in particular understandability and

comparability and consistency, than do poor performers. This suggests that firms want people to be able to read and compare the positive information that they put out so that their stakeholders and the public have a good impression of their activities and do not feel they are being misled. This indicates that there is the elective use of environmental disclosure as a strategic device to convey, proactively, a good image of a firm's engagement with environmental matters to prevent legitimacy gaps. This also suggests that firms with environmental efficiency can be more outspoken in relation to their performance (Al-Tuwaijri et al., 2004). However, poor performers tend not to give clear and comparable explanations on their performance, because they may wish to divert attention away from difficult matters and so produce complex material so as to proactively prevent possible legitimacy gaps owing to the potentiality of receiving negative criticism, which is consistent with Lindblom's third strategy. Thus it would appear that both good and poor performers take different actions to gain or maintain legitimacy, with the former disclosing their positive information, whereas the latter conceal that which is negative. Nonetheless, this legitimation effect does not appear to take place for reporting relevance and reliability, possibly because good performers put out more information than necessary, some of which may be questionable, in the hope of impressing their stakeholders and perhaps poor performers do likewise so as to hide the bad news. That is, these effects may be offsetting the relevance and reliability of the accuracy of reporting, thus leading to a neutral outcome for these quality components.

Given these findings as regards to distracting attention, it can be stated with some confidence that Patten's (1992) conclusion that "it appears that at least for environmental disclosures, threats to a firm's legitimacy do entice the firms to include more social responsibility information in their annual reports [and stand-alone reports]" (Patten, 1992, p.475), is not supported by the results of this study, which has captured the qualitative aspect of the disclosed information, because they show the opposite effect.

Accounting System (as Represented by Country of Domicile)

Hypotheses 4.1 and 7

As with the total CER quality, the level of disclosure understandability, relevance and reliability is higher for UK firms and this result could be explained by the difference in national cultures between the two countries. That is, this is although both the US and the UK are individualist, the latter has more collectivist traits than the former and firms in a society with a more individualistic approach, with a more legislative oriented environment, as in the US, provide less CER quality components than those in a more collectively-oriented society, so as to avoid a possible lawsuit from disclosing information that is not mandatorily required (Buhr and Freedman, 2001). In addition, the difference could also be related to the difference in the requirements for financial disclosures in that this influences attitudes and behaviours towards voluntary environmental disclosures, as discussed previously under total quality.

Nevertheless, the exception to these outcomes is that for comparability and consistency, where the results reveal that country of domicile (and hence accounting system) does not appear to be an important factor. This suggests that in the case of a more litigious society, like that of the US, this does not decrease levels of comparability and consistency in disclosures. In other words, this indicates the impotence of a less litigious environment with a principles-based accounting system in encouraging firms' environmental disclosure comparability and consistency and hence, reflects the fact that there is no compulsory requirement for environmental disclosures in both the UK and the US. That is, for the period of the study there was no set procedure for ensuring that disclosures were not incomparable and inconsistent in these two countries.

Other Explanations

Hypotheses 8 and 10

Regarding the components of the CER quality, the effect of the use of the GRI Guidelines appears to act only on the disclosure relevance, which is hardly surprising, given that, thus far, this has probably been their key purpose, i.e. to make reporting more closely associated with public sentiments. Moreover, the Guidelines include

"Reporting Principles for Defining Quality" (GRI, 2006b, p.13-17), which cover: balance, comparability, accuracy, timeliness, clarity and reliability and thus, the lack of any link between GRI Guidelines usage and the other quality characteristics suggests that they should be improved so as to encompass these other quality aspects of reporting in a more explicit manner, a matter returned to in the next chapter.

The positive effect of the reporting year on CER quality, especially the relevance[71] and comparability and consistency components, was expected because 2006 saw the launch of a number of environmental legislation, disclosure guidance and requirements regarding the reporting of environmental information in both the UK (which originated from the national authorities and EU directives) and the US and at the international level, as discussed in subsection 6.2.1. These effects only acting on these two quality components is perhaps because these guides and requirements largely placed the emphasis on what to report, i.e. what information to include and how to present it in a firm's report, which closely relates to the relevance and comparability and consistency of the disclosure.

Hypothesis 9

The insignificant associations between listing in independent environmental ratings and all four components are in contrast to expectations based on the proactive approach of legitimacy theory (Lindblom, 1994) and previous work (e.g. Clarkson et al., 2008; van Standen and Hooks, 2007) that elicited the existence of a positive relationship. With regards to these conflicting outcomes, as with the total CER quality, they could be attributable to the inconsistency in the evaluation methods of the proxies for the environmental ratings variable used in this study (i.e. the two indices, the FTSE4Good UK and the DJSI United States). This, as pointed out in subsection 6.2.1, could not be avoided because if only a single world index was selected as the measure of independent ratings the sample size would be much smaller and hence, the outcomes less trustworthy. Moreover, the two external ratings employed in this thesis take economic and social matters into consideration in their assessment criteria as well as environmental information, which may have affected the results of this study.

[71] This effect is indicated at the 10% level.

Summary

In general, drawing on the extant theories on reporting behaviour, as discussed in chapter 2, the results for the four qualitative characteristics of CER in this research derived from the financial reporting frameworks, have been found to provide more intricate and comprehensive explanations for reporting behaviour than if only total quality had been investigated as well as with regards to prior studies in the field. In a nutshell, with the aims of reactively narrowing and proactively preventing legitimacy gaps, the disclosure quality components are found to be strategically used to keep the public informed, change public perceptions or to distract public attention. That is, these three legitimising strategies are adopted, separately or together, depending on which of the qualitative reporting components is under consideration, with the lattermost strategy being uncovered more extensively than for total quality when the components of reporting quality are investigated separately. Moreover, the outcomes with regards to the first two legitimacy linked strategies are noteworthy, in that they can also be interpreted as an approach to address the information needs of stakeholders, consistent with the stakeholder theory. However, in this study, stakeholder theory is less powerful than legitimacy theory, because it fails to explain the outcomes regarding the two variables that can reveal stakeholder involvement (i.e. cross-listing of shares and proportion of sales revenue outside the home region), whereas legitimacy theory can do so.

More specifically, the disclosure quality with regards to understandability is strongly related to industry sector. That is, environmentally sensitive firms are less likely to disclose comprehensive information than their counterparts, which lends support to the distracting attention approach as per legitimacy theory. Moreover, for environmental performance a strongly significant positive link between this and understandability emerges, thus also indicating that such firms use a distracting of attention strategy in their reporting. Regarding the results for disclosure relevance, these are positively significant for the environmentally sensitivity sectors and profitability, which suggests that firms with these features manage their legitimacy by not confusing the public with unnecessary information. In addition, a strong negative relationship is found between

the proportion of sales revenue outside the home region and relevance in the disclosures, which is consistent with legitimacy theory's concept of distracting attention behaviour. In relation to reporting reliability, firm size and environmentally sensitive industries are positively linked, implying that firms of this nature make stronger efforts to ensure their information is accurate than their counterparts, so as to resolve a threat to their legitimacy from negative public perceptions owing to their publicly visible status. Finally, a legitimacy-related explanation is supported in the CER comparability and consistency characteristic for industries that are environmentally sensitive and those firms with high profitability. That is, these firms are expected to use a legitimacy maintenance strategy, such as performing as close as possible to the benchmark firm in that sector. Moreover, it has been elicited that environmental performance is positively linked with comparability and consistency, which provides evidence that firms adopt a distracting attention strategy. That is, good performers provide information that is easily compared with competitors or their own prior poor performance, so as to look good in the eyes of the public and hence gain or protect their legitimacy, whereas bad ones do the opposite to obtain the same result.

In addition, the differences in the national cultures, financial accounting system, GRI Guidelines usage and reporting year, are associated with substantial differences in environmental reporting quality components, but there is variation in the impact of these differences on their level of significance. Regarding this, an absence of the first two influences on the comparability and consistency characteristic reflects a lack of disclosure requirements for environmental information, in both the UK and the US during the study period, whereas the effect that the use of GRI Guidelines acts only on disclosure relevance provides a steer for improving them. Furthermore, regarding the reporting year, the improvement on reporting relevance and comparability and consistency between 2005 and 2006 was probably because of an upsurge in voluntary reporting requirements and environmental legislation during this period of time in the two focal countries.

6.3 Tests of CER Behaviours under Institutional Theory (Hypotheses 10.1 and 10.2)

In the second study, the purpose was to test if companies engage in mimetic or coercive behaviour, as described in institutional theory, in their environmental reporting. In this regard, one-sample t-tests or Wilcoxon signed-rank tests and a decline in the residual variances from the year-specific OLS regressions, were employed to test for the presence of reporting convergence in terms of the quality and hence, the existence of mimetic behaviour. If no convergence emerged, coercive behaviour was subsequently probed. Given the evidence for the hypotheses in the previous chapter, as summarised in table 6.4, these two aspects are discussed below, in terms of total CER quality as well as its components.

Table 6.4: Hypotheses Test Results for Total CER Quality and Its Four Components

Hypothesis	Results	Supported?				
		Total CER Quality	Understand-ability	Relevance	Reliability	Comparability and Consistency
H10.1 and *H10.2*	The convergence of total environmental disclosure quality is not evident. That is, despite the higher CER quality than that of their sectoral followers in 2005, lead firms kept on increasing it over the two years and so did followers When considering the components of quality, the results show reliability and comparability and consistency convergence at best. More specifically, the disclosure reliability and comparability and consistency by both types of firm become more alike over time, although there is no decrease in these aspects of reporting by lead firms. However, reporting convergence is not found in the understandability or relevance characteristics. Regarding this, both types of firm appear to have adapted their own existing practices of the former, whereas they increased the latter aspect of disclosure quality over time. This indicates that sample firms treat the four components of reporting quality unequally, probably as a result of a lack of a robust framework for disclosing environmental information in both the UK and the US, and each observed practice regarding this matter is discussed in detail in the text below.	Yes (for the followers firms)	No	No	Yes	Yes

6.3.1 Total CER Quality

Evidence for Mimetic Behaviour

Given that, as yet, there is no uniform legislative underlying reporting framework for environmental information disclosure, it is not surprising that the findings, as summarised in table 6.4, appear to suggest the existence of industry leader imitation in CER over time. That is, although the convergence of total environmental disclosure quality is not evident, there is a pattern that would suggest a mimetic-linked interpretation by the follower firms, i.e. one-way mimetic behaviour and it is to be expected that a firm tends to consider the reporting practices of its sector leader as a benchmark. This is in tune with DiMaggio and Powell's (1983) mimetic activity proposed under institutional theory, by which firms are pressured to self-adjust to reduce uncertainty in relation to technologies, goals or environmental expectations by imitating procedure adopted by other organisations that are believed to be legitimate or successful, so as to gain their legitimacy and this is substantially consistent with the practices observed by Cormier et al. (2005).

Evidence for Stakeholder and Legitimacy Theories

In relation to the observed upward total quality environmental reporting of the lead firms, this could be due to pressure from stakeholders for the entire industry sector to up their game in this regard. That is, if pressure is put on the lead firm to be an outstanding benchmark in its sector then eventually all other firms will have to aspire to match its standards, if they are to prosper and thus, if this is so, then it is the stakeholder theory perspective that captures this behaviour. From a different angle, the lead firms invariably want to maintain their position and hence, they could be using improvements to their environmental disclosure partly to achieve this, thus supporting legitimacy theory.

6.3.2 The Four Qualitative Characteristics of CER

Evidence of Mimetic Behaviour

When considering the components of quality, the results showing reliability and comparability and consistency convergence at best indicate that a firm's environmental reporting regarding these components can be explained by a mimetic isomorphism. In this regard, there is an observable distinction between the CER of the leaders and that of the followers for these two characteristics in the previous period of reporting, which resulted in an upward move by the followers in the next year, whereas there is no increase in such activity by the leaders. Hence, it would appear that there is a two-way of mimicry, i.e. both from the leaders and from the followers. Consistent with DiMaggio and Powell's (1983) mimetic isomorphism under the institutional theory, the more alike the disclosure reliability and comparability and consistency become over time, reflects the force that firms imitate the disclosure structure of other firms to reduce uncertainty. Regarding this, a possible explanation is that the follower firms recognise they are behind and hence, they react by increasing their performance on these two components of CER quality so as to allay any of the public's concerns. At the same time, the leaders may realise their lead position and make no effort to increase the gap. Moreover, this response to the public by both the leaders and the followers is consistent with their acting to maintain or gain their legitimacy as per the particular theory with that name. That is, this informs the public on their environmentally related performance and/or changes their perceptions regarding this performance to show that their administration conforms to the standards and values germane to the society, and these explanations fit with Lindblom's (1994) first and second strategies, respectively.

As to why these two characteristics are the only ones exhibiting mimetic behaviour, it could be that regarding their elements, such as verification statements for reliability and the very nature of comparability and consistency, allow for these aspects of reporting to be more immediately interpreted by the public than the other two quality components, namely understandability and relevance and hence, firms pay more attention to their authenticity. More specifically, if verification statements are obviously inferior to those of the lead firm, a firm will attempt to redress this as quickly as possible, for fear of

falling out of favour with the public. Regarding comparability and consistency in relation to past performance and that of the lead firm, these quality components are easily accessible to the public and therefore, it is important for firms to address these effectively on a regular basis. The difference in relation to the other two components is returned to in the next subsection.

Evidence for Coercive Behaviour

Recall no difference was reported in understandability for leaders and followers in the first year and neither was there such a difference for the relevance characteristic, although relevance increased for both types of firm over time. Thus, these behaviours can be seen as pertaining to institutional theory's coercion, in that in neither case, as a response to influential stakeholder pressure, does the level of reporting quality fall. According to DiMaggio and Powell (1983), coercion takes place when the organisation changes in response to pressures from other organisations on which it strongly depends for resources and support. For environmental related information of a financial nature, this coercive mechanism is principally the mandatory requirement of firms having to obey accounting standards relating to internalised environmental implications as promulgated by the relevant authoritative bodies (e.g. the UK ASB, the US FASB and the IASB). Regarding those that are non-financial and hence, not mandated, i.e. the predominant context in the CER here, this coercive mechanism, although one underpinned by the voluntary requirement of firms to provide environmentally-related information, still exists because of the pressure from powerful supra-national bodies working on sustainable development and environmental protection (e.g. UN, OECD, etc.), non-governmental organisations (NGOs) dedicated to environmental sustainability (e.g. GRI, Ceres, CDP, AccountAbility, etc.) or institutional investors which they are dependent upon. That is, if firms do not respond to these types of pressure, then they may alienate certain stakeholders, which suggests that this voluntarism may well be qualified in its nature. This observed routine practice is considerably consistent with the observation of Cormier et al. (2005), although they employed a different approach in verifying the coercive behaviour and discovered it in total disclosure as a whole rather than in a specific characteristic, as in this study.

With respect to coercion, however, because there is no difference between leaders and followers for understandability and relevance in year one, there is no incentive to improve them in the next year. This raises the question, in particular, as to why there was an increase in the relevance of disclosures over the two years and one is provided in the next subsection. Further, regarding the lack of mimetic behaviour in the results for the two aforementioned characteristics, it is posited that these two qualitative characteristics are not easily comprehended by the general public, because they do not usually have the capacity or the time to establish the level of preciseness and appropriateness of the information they are presented with. Consequently, it is put forward that this leads to firms paying less attention to these aspects. An alternative explanation for the flat-lining of the understandability quality during the two years can be found in the low overall scores for this characteristic, as with all four, as shown in table 5.7 of the previous chapter. That is, because the firms exhibit low understandability it could be that they are unable to identify an effective model for improving their own performance on this matter, i.e. they do not recognise a 'best practice' that they can imitate.

Evidence for Stakeholder and Legitimacy Theories

As pointed out above, the relevance of the disclosure improved over the two years for both leaders and followers. This could be attributed to the introduction of the environmental legislation, disclosure guidance and disclosure requirements in 2006 in both the UK and the US context, as discussed in subsections 6.2.1 and 6.2.2, especially the guidelines, such as the latest version at the commencement of the study of the GRI Guidelines (2006b), DEFRA's guidelines (DEFRA, 2006) and the Global Framework for Climate Risk Disclosure (UNEP, 2006), whereby firms in the second year of reporting were able to use these to ensure the exclusion of superfluous information and hence, increase the level of relevance. The introduction of such guidelines is often as a result of other stakeholder pressure regarding environmental responsibility and hence, this observed behaviour pertains to the stakeholder theory perspective. Moreover, the positive result, in terms of change, for relevance in reporting could also be attributed to a legitimacy theory perspective, whereby firms are ensuring that their stakeholders are not becoming mistrustful regarding their disclosures, so as not to jeopardise their

legitimacy, which is consistent with the observation of Deegan and Gordon (1996) of an increase in the disclosure amount across time.

6.4 The Interrelation between Financial and Environmental Performance (Hypotheses 11.1 and 11.2)

The findings from the third study show that concurrent financial and environmental performance is not significantly positively correlated and nor is a relationship between lagged environmental and financial performance found. The former evidence is contrary to the resource driven supposition and previous work, which asserts that environmental performance is the result of financial resource availability, whereas the latter is inconsistent with the results of prior studies that have investigated the impact of environmental performance on short-term financial performance. Next, there is detailed consideration of the outcomes.

6.4.1 The Effect of Financial Performance on Environmental Performance

The insignificant correlation between firm profitability and GHGs emissions found from the regression, as per equation (6), does not provide a convincing demonstration of *H11.1*. That is, there is no effect of firm financial capability on environmental performance (interpreted as the inverse measure of tonnes of CO_2-equivalent emissions on a one million US dollar operating revenue of a firm) in the same period. This is in contrast to the argument that financial resource drives a firm's environmental responsibility actions as found in the empirical evidence of Waddock and Graves (1997) and Jaggi and Freedman (1992). However, these works employed lagged profitability as the financial driver rather than that for the same period, as employed in this study, which may have led to these conflicting outcomes. That is, the impact of a firm's available finance on its environmental efficiency may appear with a time lag of one year or more, but this is not considered any further here, because it is outside the main scope of this research.

The results from the first study have suggested that there is an impact of a firm's financial capability on its environmental disclosure quality, whilst the findings here indicate that there is an absence of its impact on environmental efficiency. Consequently, it is possible that the financial performance of a firm enhances the disclosure in the same period but not environmental performance. That is, when the financial resource is slack a firm would prioritise its environmentally related investments on the same period's disclosure, rather than on initiatives to improve performance, perhaps so as to respond to public expectations and/or to narrow legitimacy gaps resulting from a high level of public exposure. Alternatively, the neutral relationship found between the concurrent financial and environmental performance could be seen as being consistent with McWilliams and Seigel's (2001) supposition that the costs of providing environmental initiatives and their revenues are perfectly offset in equilibrium and hence, profits will be equal for a firm that exhibits environmentally responsible attributes and one that does not.

6.4.2 The Effect of Environmental Performance on Financial Performance

The observation that companies that are more efficient regarding the level of emissions they have produced in the previous period do not gain higher profitability is contrary to the *H11.2* and to the prior empirical studies, e.g. Hart and Ahuja (1996), Jaggi and Freedman (1992) and Orlitzky et al. (2003). Moreover, the findings also show an absence of an impact for the other one-year lagged environmentally-related information (i.e. the environmental disclosure quality, the use of the GRI guidelines in such disclosure and a membership listing in an independent environmental index) on a firm's profitability. In terms of the results for a one year lagged environmental disclosure quality, these are inconsistent with the proposal in several market-based economic performance studies, including Ingram (1978), Anderson and Frankle (1980) and Richardson and Welker (2001), that the reporting of environmental information affects firm market returns. However, a number of other studies, such as Murray et al. (2006) and Al-Tuwaijri et al. (2004), also failed to find an association between lagged CER and market-based financial performance.

With the absence of effects on firm profitability, this indicates that stakeholders do not acknowledge a firm's environmentally related information for the previous period in their decision making that has a subsequent impact on financial performance. That is, such one year lagged information does not appear to have value that is relevant to stakeholders, regardless of whether it is received from a third party's database or from a firm's own environmental disclosure. In other words, this suggests that messages about a firm's environmental orientation do not facilitate its becoming more financially successful. However, it would be too expeditious to conclude so, for the absence of an association between such environmentally related information and profitability could alternatively be attributable to the short period of this study. Regarding this, the impact of environmental information, in terms of polluting performance, the overall disclosed information, the use of GRI guidelines in a firm's disclosure and listing in independent environmental ratings, may have appeared with a time lag of more than one year, had this been built into the research design. As expected, the results indicate the presence of an industry effect as well as a past profitability effect and a firm size effect is also found if the natural logarithm of market capitalisation is used as a size proxy. Furthermore, given that the two sample countries are comparable in terms of their having developed capital markets, country of domicile turns out not to be influential on firm profitability.

6.4.3 Summary

No evidence has been found supporting there being an impact of financial performance on environmental performance, as manifested by the levels of GHGs emissions nor of environmental performance and other forms of environmentally-related information on financial performance. As regards the former, even though the results are consistent with the argument of McWilliams and Seigel (2001) that no relationship exists, the use of lagged financial performance would be necessary to demonstrate this more clearly than the concurrent form employed here. As for the latter, the environmental efficiency in terms of emissions pollution, the overall environmental information provided by firms, the use of GRI guidelines in CER and listing in an independent environmental rating, fail to demonstrate a statistically significant relation with short-term financial performance.

6.5 Synthesis

Owing to the absence of compulsory requirement and the lack of a robust theoretical framework, firm disclosures on non-financial matters of environmental information have taken a variety of forms. This researcher has thus considered environmental disclosure practices from a preparer's perspective, based on four identified qualitative characteristics and the first and second studies have suggested different drivers that are pushing the reporting practices forward, whilst the third study, investigating the consequence of such practices on the relation between environmental performance and financial performance and has provided no evidence of any linkage. The results in chapter 5 and the discussion in this chapter have permitted the drawing of a number of conclusions. More specifically, by using the methods underpinning the main thrust of the thesis, i.e. constructing the measures of each qualitative characteristic and employing their scores in three empirical studies, evidence of inter-country differences, legitimacy management, stakeholder response, institutional behaviour, and the GRI Guidelines' practicality has been convincingly found. That is, the multiple nature of the work and the distinctive individuality of each qualitative characteristic have allowed for these findings to emerge variously across the piece. However, no evidence has been elicited for the effects of one-year lagged firm environmental information and performance on financial efficiency or in relation to synchronous (i.e. not lagged) financial performance on environmental performance.

7 Conclusion

As discussed in chapter 2, a comprehensive framework for corporate environmental information reporting would enhance the quality of the information provided and minimise the scope for selective disclosure. This study has sought to establish such a framework through the adaptation of principles used in financial reporting frameworks, which align reporting quality with the characteristics of decision-useful information. The validity of this approach was assessed using empirical tests of determinants of reporting with measures based on this framework, i.e. whether they can provide a better understanding of practices based on existing disclosure theories than other measures employed in prior research, such as those based on volumes or the comprehensiveness of the reporting content.

Through the practical application of the framework the actual practices of the UK and the US companies, in terms of the quality in environmental reporting, were probed. The main research started with a content analysis, which drew upon the theoretical framework for the CER developed in chapter 3. That is, the content of environmental disclosure was analysed for four characteristics: understandability, relevance, reliability and comparability and consistency, which after being given equal weighting were aggregated to provide the overall/total quality. Based on the actual CER practices in terms of quality that were observed, several hypotheses were put forward for testing relating to the factors influencing variations in such practices. This was then extended to include an investigation into the interrelationship between financial and environmental performance, with the key aim being to establish whether or not the latter and/or the information disclosed are value-relevant to firm financial performance.

The research hypotheses were tested in accordance with the three analytic methods provided in chapter 4 and the results were reported in the chapter 5. In this respect, there was an investigation into the linear (positively or negatively) effects[72] of the possible determinants of the disclosure quality, the presence/absence of institutional theory's

[72] Owing to the discrete nature of the comparability and consistency score, the effects investigated were non-linear involving pooled logistic regression.

mimetic or coercive behaviours in the disclosure and the influence of firm financial performance on environmental performance and vice versa.

In chapter 6, more reflective assessments were made and conclusions were drawn according to the literature reviewed and analyses carried out in the earlier chapters. Some general conclusions may be drawn from this discussion and these are given in the following part of the study.

7.1 General Conclusions

Following the original observation of Gray et al. (1995) and Cormier et al. (2005) on CER practices, from the volumetric and the content-comprehensive perspectives, respectively, this researcher posited that environmental disclosure practice should be considered as a multi dimensional phenomenon, because it can be explained by more than a single theoretical background. In this regard, the discussion in chapter 6 has provided strong evidence that considering the outcomes of this research under the multiple lenses of: stakeholder, legitimacy and institutional theories, and applying a set of treatments, has resulted in a more thorough and robust analysis than when single theoretical interpretations have been sought by other scholars. That is, each of the first two studies variously gave results that could be used to confirm or refute these theories, although not at the same time. Consequently, the methodology adopted for this research has allowed for the exploration of the complexity of CER quality in relation to the firm characteristics that lead to its variation, which could not have been achieved otherwise. The empirical results from applying this methodology have shown that mainly legitimacy theory in the first study and institutional theory in the second are capable of explaining variability in the disclosure practices from a qualitative perspective.

More importantly, unlike other measures of reporting quality and volume employed in previous studies, four distinct measures of the qualitative characteristics of CER that can be aggregated to provide total quality have been employed in this research, thus providing a more comprehensive understanding of this subject matter. By way of explanation for this claim, first of all, regarding legitimacy management, several different tactics that firms use in relation to CER decisions to prevent a legitimacy gap

or to narrow one have been identified in the previous chapter (subsection 6.2.2), which involve manipulating various aspects of the reporting quality and this would have not been observed if the components of reporting quality were not taken into consideration. For instance, it was elicited that firms from highly sensitive industries report the highest levels of quality, in order to convince the public that there are no skeletons in the closet (Lindblom's (1994) first and/or second strategies), but the understandability of these disclosures acts in a negative way. That is, high polluting industries would appear to seek legitimacy through Lindblom's third strategy, where the comprehensiveness of the reporting is used to conceal any unpleasant facts, whilst still giving the impression that nothing is being withheld, as all the other qualitative characteristics turned out to be significantly positive. This distracting attention strategy interpretation is supported by the finding that industries with a low impact on the environment have high levels of understandability in their CER.

A strategic importance as regards legitimacy for firms was also found, in the outcomes for the extent of overseas stakeholders in that the higher this is the lower the reporting relevance. That is, under these circumstances firms may highlight other irrelevant issues in their CER at the expense of the reporting quality so as to distract attention from problematic areas, consistent with Lindblom's third legitimating strategy, whereas rejecting stakeholder theory, and again this would only have been detected using distinct CER component measures. Similarly, a firm's management of its levels of understandability and comparability and consistency when there is a change in its environmental performance betrayed a distracting attention strategy being used. That is, this shows that through the manipulation of text comprehensibility, interactive features and comparability and consistency of the issues at hand, firms act to divert attention from bad news.

Second, regarding the tests for support or refutation of institutional theory, two types of institutional isomorphism (i.e. mimetic and coercive isomorphism) were observed and hence this outcome is consistent with this theory. However, each of these was only evident in specific components of CER quality, with the former behaviour, which is aimed at reaching the same reporting standards as the benchmarker, being apparent in the reliability and the comparability and consistency of the reporting, whereas the latter was found for understandability. This routine regarding understandability can be

explained by the very low score for this characteristic in that lead firms are unable to provide any insights to the followers on how to improve this aspect of their reporting. Further, institutional isomorphism has not been borne out by the observation regarding CER relevance, which reflects a pattern that suggests firms provide relevant information for concerned stakeholders so as to gain or maintain legitimacy, in accordance with the stakeholder and legitimacy theories. The fact that the results for three of the quality aspects support the existence of contrasting institutionalisation mechanisms, reveals that differential behaviours are present within the different quality categories of environmental reporting, which could not have been elicited through a total quality study and hence, being the first research to disaggregate this, this brings a completely new contribution to the literature.

Third, the findings in relation to inter-country variability of the CER qualitative components regarding: understandability, relevance and reliability, but not comparability and consistency, offer further insights into firms' reporting behaviour. That is, for the three foremost characteristics a significant effect of the differences in national cultures and financial accounting system has been found, showing that the culture of financial reporting transfers through to the CER behaviour. That is, this outcome supports one of the key motivations of this research and the devised framework of investigating whether the financial reporting context determines the nature of voluntary non-financial reporting. The lack of distinction between the UK and the US in relation to comparability and consistency reflects the absence of a mandatory requirement for CER, and taking this with the above evidence of strategic legitimisation and institutionalisation behaviour, suggests that under voluntary reporting firms appear to act mainly in their own interests rather than those of the stakeholders. Therefore, it is posited that this provides grounds for legislation that will require production of CER and it should state what information to disclose and what format details should be provided, encompassing all of the CER qualitative components. Further, these outcomes for the US firms indicate that those authorities responsible for reporting environmental information need to consider ways to improve its overall quality to at least match UK levels.

Finally, because the measures used in prior research on environmental disclosure did not distinguish qualitative components nor probe the effect of GRI Guidelines usage,

they failed to elicit the noteworthy outcome that this usage only has a positive effect on relevance and this raises the question of their practicality. That is, since the other three qualitative components of reporting did not appear to be enhanced when any version of the Guidelines[73] were used in the CER, their practicality appeared to be limited. This shortcoming could be promoted to alert users (and preparers) of CER who at present may completely have trust in their effectiveness for structuring CER. Moreover, this evidence points to the need for the development of a more meaningful environmental reporting framework, one which engenders all four characteristics of decision-useful information for environmental disclosure.

In sum, it can be concluded that each facet of firm disclosure quality has its own decisive drivers and a clear understanding in reporting behaviour based on existing theories has emerged in this thesis through the use of a novel CER framework derived from the financial reporting frameworks, i.e. defined by the characteristics of decision-useful information. That is, given this approach it is posited that a reasonable claim is that environmental disclosure quality is meaningfully captured by this framework based on financial reporting quality and thus, it is put forward that is a better way for codifying all forms of non-financial reporting and not just those environmentally-related as in this thesis.

Turning to the extended sphere involving the consequences of the disclosure practices and environmental performance underpinning the third study, the methodology used in this study has failed to find evidence of financial benefit in relation to the sample firms' one year lagged environmental information disclosure quality and environmental performance, i.e. no value-relevance to stakeholders has been found. However, this researcher is reluctant to conclude that there is an absence of such an effect, because the use of reported information and environmental performance with a time lag of two years or more, as has been the case in other studies, could have resulted in a positive outcome.

7.2 Contributions of the Research

[73] The G3.1 Sustainability Reporting Guidelines (GRI, 2011) was excluded, because it was published towards the end of this study.

As a result of the key outcomes and analyses of this research, as presented in chapters 4, 5 and 6, several contributions of this work to the extant literature are put forward. Moreover, it is posited that the results of this research endeavour not only provide insights for academics in the field, but also give enhanced understanding to stakeholders in businesses, such as: policy makers, managers as the CER preparers, and shareholders and other stakeholders, as the CER users.

7.2.1 Contributions to the Academic Literature

This study has addressed areas regarding which there has been scant prior research, namely the informational quality of environmental disclosure and the value relevance of this to financial performance. Two areas in relation to the method development appear to be most worthy of additional comment, i.e. the contribution of the theoretical framework for measuring CER quality and the value of the hypotheses testing of: the stakeholder, legitimacy and institutional theories, in terms of such reporting quality.

Framework for the CER Quality

In contrast to previous studies that have relied on volumetric approaches to measure environmental disclosure and others that have employed metrics regarding the extensiveness of the information content, this research has involved systematically recording the information content based on its qualitative aspects, thereby providing for richer analyses. More specifically, this researcher adopted the users' decision-usefulness concept of financial reporting frameworks to consider the suitable elements of non-financial environmental information, as taken from the most widely employed worldwide non-financial reporting guidelines, the GRI Guidelines (GRI, 2006b). This is because although the Guidelines mention quality aspects they fail to correspond well with their suggested indicators regarding the scope and detail of what should constitute these, whereas understandability, relevance, reliability and comparability and consistency, found in financial reporting frameworks are able to capture the quality of non-financial reporting. That is, although the Guidelines offer a framework for CER it was necessary in this research to categorise their contents under these headings as well

as import some aspects of financial reporting missing from them. Moreover, for the relevance, reliability and comparability and consistency qualitative characteristics, the industry-specific relevant issues contained within the GRI Supplements (GRI, 2003, 2005a, 2005b, 2006a, 2007, 2008a, 2008b) and the DEFRA reporting guidelines for UK business (DEFRA, 2006) were used to develop the measurement metrics. Through comparison of the financial and non-financial guidelines a set of elements comprising each of the four qualitative characteristics was drawn up and subsequently, a detailed scoring system was assigned to the different practices and features of firms under each element.

There is a growing body of research claiming that their measures for examining environmental disclosure decision-making have embraced the qualitative dimension. To the extent that this researcher is aware; however, none of these has investigated the practices of firm environmental disclosure by employing an industry-specific measure. The industry-specific metrics used for measurement not only allowed for the control of the qualitative degree of disclosure made by firms with limited environmentally-related issues of concern, but also enabled the investigation of the completeness of such reporting of those that are highly environmentally sensitive. In sum, by assimilating industry-specific measurement methods into the reporting framework, this researcher has added to the extant literature, because no such delineation has previously been made.

Hypotheses Generation Linked to the CER Quality

The formulation of the specific hypotheses to test for various explanatory theories in social and environmental accounting, such as the: stakeholder, legitimacy and institutional theories, has rested upon the developed framework for CER quality. The subsequent testing of these hypotheses has resulted in eliciting the factors that lead to variation in the quality of reporting and hence, has provided a number of new additions to the research in this area. Moreover, a further test of the relevance of CER quality (and environmental performance) to financial performance contributes new evidence to the field. More specifically, these contributions are as follows.

First, the proposition that differences in firm environmental disclosure can be attributed to variables, such as: firm size, industry sector, country and profitability (*H2* to *H5*), has exercised previous researchers. Regarding this, this research has provided enrichment in relation to the metrics to record the environmental information content by considering this variation using a robust set of CER qualitative characteristics. Referring to the firm characteristics relating to country, the incorporation of two variables, consistent with the notion of concerned stakeholders under stakeholder theory, i.e. cross-listing of shares, in accordance with Cormier et al. (2005) and proportion of sales revenue outside the home region, despite this perspective being dropped in favour of that of legitimacy theory for this part of the analysis, has also contributed to the literature as there has been limited prior research on these two matters.

Second, the inclusion of panel data from two countries, the UK and the US, has enabled the reinforcement of the contention that environmental disclosure is affected by legitimacy-related factors as well as strengthened the validity of the identified behaviours under institutional theory, in these two contexts. In addition, the panel data has also been drawn upon to compare the quality of environmental disclosures from different financial reporting regimes, because it was projected that this could conceivably have an influence on the non-financial reporting pattern (*H7*) and although this has been called for in the financial reporting literature (Beattie and McInnes, 2006), scant attention has been paid to the non-financial aspects of this matter, in particular within the comparative circumstance of the UK and the US, as focussed on here.

Third, although the GRI Guidelines have been used in previous studies of CER (e.g. Clarkson et al., 2008; Ho and Taylor, 2007), the proposition that they can be used as a proxy for concerned society actors (*H8*) is new. That is, the incorporation of the use of the Guidelines as an explanatory variable for the CER quality in this research has also allowed for an assessment as to whether they need improvement. The findings in this regard, have shown that the Guidelines, which excluded G3.1 (GRI, 2011) as it was published towards the end of this study, are providing the relevance characteristic of the reporting quality, but not the other three, and hence, there are strong grounds for their being made more robust.

Fourth, inspired by Cormier et al.'s (2005) work, the extension of an environmental disclosure motivations examination to include the tests of mimetic/coercive reporting behaviours under institutional theory (*H10.1* and *H10.2*) has contributed to the current research into the reasons for disclosure in relation to quality in the UK and the US context. With regards to this, a new treatment was employed involving establishing the convergence/divergence of reporting quality of lead and follower firms in an industry along with that of Cormier et al. (2005). Consequently, the method used has allowed for further understanding of the reporting behaviour in situations where institutional theory's mimetic form is not found, thus adding to the understanding of the infant-stage research into reporting behaviours as per this particular theory.

Fifth, the thesis outcomes offer insights into the relationships between environmental reporting and performance (*H6*), and between financial and environmental performance (*H11.1* and *H11.2*), by using the inverse measure of the GHGs emissions on one million US dollars operating revenue of a firm as the proxy for the lattermost. In relation to this, in contrast to the prior studies' usage of: undisclosed principle of external rankings and a limited range of environmental data from external databases, which restrict the generalisability of the findings, or the use of aggregated fines, which result in a mismatch between the data coverage in terms of time and the information disclosure period, this researcher employed the commonly recognised quantitative measure of GHGs emissions from the CDP database, standardised by a firm's operating revenues. In this regard, as far as this researcher is aware, no prior research, when considering the relationship between environmental disclosure and performance and between financial and environmental performance, has drawn upon this technique. Whilst using this single measure as a proxy for environmental performance could be seen as being too simplistic, it does have the advantage that because GHGs are common to the majority of firms this has allowed for robust comparisons across industries and time. That is, previous studies have used proxies, such as toxic waste and environmental fines (Al-Tuwaijri et al., 2004; Brammer and Pavelin, 2006a), which pertain to fewer industries and hence, this has restricted these sorts of comparisons. Further, by using data for two years on environmental performance in this way, this has provided a steer for future research regarding its relation with CER over time, which aligns uniform data across time. With respect to this, as explained in chapter 2, the aforementioned study using fines was limited because these were cumulative over several years and so it was not

possible to ascertain the effects of the imposition of a single fine on CER from a short term perspective.

7.2.2 Contributions to Policy Makers, Reporting Preparers and Users

Turning to the potential benefits of the findings to policy makers, CER preparers and users, the following are identified. First, having considered environmental disclosure practices from a preparer's perspective in this study, the UK firms, on average, emerged as providing higher informational quality than the US firms. Thus, it would appear that a financial accounting principles-based system, like that in the UK, leads to more willingness to disclose, voluntarily, good quality non-financial information than a rules-based system, such as that in the US and consequently it is put forward that policy makers need to take note that financial reporting can shape the nature of voluntary CER. Moreover, the results suggest that those in the US should not to presume that their rules-based system in financial reporting leads to higher CER quality than the alternative and in fact, the opposite has been found to be the case. However, there is one caveat to this outcome and that is that although higher quality for the UK than the US was found for understandability, relevance and reliability, it was not for the comparability and consistency characteristic. In this researcher's opinion, this reflects the absence of mandatory requirements in both countries and hence, it is put forward that the framework developed in this thesis could form the basis for the development of these.

Second, practitioners in industry and external verifiers/assurers who provide services for monitoring reporting standards could use the thesis outcomes to improve their current practice. For instance, the framework of qualitative characteristics of the environmental information identified could be used to improve the robustness of disclosures, in particular, by ensuring that content reporting is underpinned by these standards of quality. Moreover, implications for corporate strategy can be also derived from this research, whereby the framework could help managers in their disclosure preparation whatever their motivation. For instance, they could use it as reporting guidance so as to achieve or maintain their legitimacy, to gain third party attention through the disclosure or even to hide their inefficiencies.

Third, considering how the users, who include current and potential investors, suppliers, customers, employees, environmental pressure groups, media, etc., could benefit from the devised framework, it is put forward that it is: universally applicable, industry-specific and allows for robust comparison of the quality of corporate disclosed environmental information. Moreover, because of its structure the users will be able to assess firm disclosure in relation to their own priorities in their decision making process, i.e. whether it is understandable, relevant, reliable and/or comparable and consistent.

7.3 Limitations of the Research

Like many previous empirical studies this research has its limitations. First, in the first study on the determinants of variation in CER quality and the third study regarding the interrelation between financial and environmental performance, owing to the lack of continuous environmental performance data many listed firms had to be excluded from the empirical analysis and as a result, the data available comprised approximately half of the top 100 listed firms from each of the sample countries, i.e. approximately half of the FTSE100 for the UK and the S&P100 for the US. That is, the investigation was restricted to covering large firms in the two countries, which consequently limited the number and type of firms included in the exploration into the impact of firm characteristics upon voluntary environmental disclosure and its value relevance to financial performance.

Second, this research has proved no exception in having had to deal with the problem of defining variables. Regarding this, as mentioned above, one might question the use of the inverse measure of GHGs emissions standardised by firm operating revenue as a proxy for a firm's environmental performance and it could well be that using a set of measures would prove more effective. Third, the use of cross-sectional data for only two countries for a relatively short two-year period and the environmental information disclosure measurement methods restricts comparison of the outcomes with previous studies. Moreover, this limited coverage has meant that the results for convergence or divergence between lead and follower firms as well as the differences in the accounting system, only hold from a short-term perspective and may not be replicated for other

countries. Further, in view of the investigation of value-relevance of firm environmental information and performance (i.e. the third study in this research), the use of a simple one-year lag structure for the analysis reflects a bounded period of time and it may well be the case that the impacts of these factors that did not emerge in this research occur with a time lag of more than one year.

Fourth, like other previous content analysis studies it could be argued that the approach to scoring environmental disclosure quality employed in this study retains by its nature a subjective element as it has involved this researcher's judgement. Nevertheless, it is strongly believed that the use of the objective users' decision usefulness concept taken from financial reporting frameworks and the employment of the external and independent non-financial reporting guidelines to form the framework for environmental disclosure quality measurement, with very detailed category construction, has lessened this subjectivity when compared with previous studies.

Referring to the above points, it could be argued that they all relate to the limitations of the positivist stance taken to measure the disclosure and explain its motivation using the three motivational theories in this research, as discussed in chapter 2. That is, this researcher's preconceptions, to some extent, have influenced the research design and these include: the particular phenomenon selected, the methods employed and the assumptions made as well as the limitations of the theories per se. Therefore, the empirical results and conclusions drawn from the three studies can be at best used to support or suggest rejection of these theories, but not with absolute certainty.

7.4 Proposals for Future Research

The CER quality framework and the results from its application in this thesis have revealed the importance for future researchers to continue analysing the complex relationship between environmental disclosure and its determinants as well as investigating the importance of the disclosure (and the environmental performance) to possible users. This research has built upon prior disclosure measurement methods, which have only considered how a firm makes its non-financial reporting decisions in terms of volume or content comprehensiveness, without a robust consideration of the

quality of disclosed information and thus, insufficient attention has been paid to what actually influences a firm's reporting quality. That is, it is posited that it has clearly been demonstrated in this thesis that explanations for the variation in environmental reporting across firms can also, and more robustly, be provided by examining disclosure quality.

Drawing upon this framework, future research on CER could employ a larger sample and in particular, there needs to be a way to capture the behaviour of smaller firms so as to test whether or not the outcomes for this research hold in a more generalisable way. This is now more feasible than using the data for the two focal years in this research, for nowadays the available environmental performance information, which previously limited the sample size, are provided by many more firms. Moreover, by including a larger sample over a longer period of time, it will be possible, perhaps once and for all, to establish whether there is a link between CER quality and subsequent period financial performance.

A further suggestion for future work is to extend the longitudinal nature of this method to several more years to see whether variations are found to this research's outcomes or whether they are verified. In relation to this, some important potential findings pertaining to the mimetic/coercive behaviours under institutional theory could be observed much more comprehensively and more robust conclusions drawn, than was the case here. In addition, the framework could be applied to several countries in order to see if the variation found between rules-based and principles-based financial accounting systems is apparent across the world. Moreover, as has been pointed out in an earlier chapter, a further examination of the value-relevance of CER information and firm environmental performance (i.e. the third study in this research) is needed that covers more than one year's time lag. This could be achieved using the current independent variables data for 2005 and 2006 for, for instance, financial performance data collected for 2007 and 2008 as well as 2008 and 2009 and so forth.

Further, the four qualitative characteristics of environmental disclosure and their elements as identified in this research could be used as the basis of a qualitative study, such as a case study or a survey aimed at institutional investors, to investigate whether the outcomes ring true from the user perspective. Finally, future work could involve

extending the investigation to areas in addition to environmental reporting, such as, social, community, ethical or philanthropic matters, which is feasible given that the GRI sector supplements have guidelines for collecting such information and the framework applied in this research could be used for this purpose. However, this could only be achieved if the supplements become available for all sectors, which may not be for some time. Otherwise, an alternative approach will need to be adopted in terms of the scoring system used under the qualitative framework.

References

Abbot, W.F. and Monsen, R.J. (1979) 'On the Measurement of Corporate Social Responsibility: Self-Reported Disclosures as a Method of Measuring Corporate Social Involvement', *Academy of Management Journal*, 22(3), pp. 501-515.

Accounting Standards Board (1999) *Statement of Principles for Financial Reporting*. London: Accounting Standards Board.

Adams, C.A., Hill, W-Y. and Roberts, C.B. (1998) 'Corporate Social Reporting Practices in Western Europe: Legitimating Corporate Behaviour?', *The British Accounting Review*, 30(1), pp. 1-21.

Adams, C.A. and Kuasirikun, N. (2000) 'A comparative analysis of corporate reporting on ethical issues by UK and German chemical and pharmaceutical companies', *The European Accounting Review*, 9(1), pp. 53-79.

Adelberg, A.H. (1979) 'A Methodology for Measuring the Understandability of Financial Report Messages', *Journal of Accounting Research*, 17(2), pp. 565-592.

Adelberg, A.H., Lewis, R.A. and Schiff, M. (1980) 'Financial reports can be made more understandable', *Journal of Accountancy*, 149(6), pp. 44-51.

Alford, A.W. and Boatsman, J.R. (1995) 'Predicting Long-term Stock Return Volatility: Implications for Accounting and Evaluation of Equity Derivatives' *The Accounting Review*, 70(4), pp. 599-618.

Ali, A. and Hwang, L. (2000) 'Country-Specific Factors Related to Financial Reporting and the Value Relevance of Accounting Data', *Journal of Accounting Research*, 38(1), pp. 1-21.

Al-Tuwaijri, S.A., Christensen, T.E. and Hughes II, K.E. (2004) 'The relations among environmental disclosure, environmental performance, and economic performance: a

simultaneous equations approach', *Accounting, Organizations & Society*, 29(5-6), pp. 447-471.

American Institute of Certified Public Accountants (1996) *Environmental Remediation Liabilities: Statement of Position No. 96-1*. New York: American Institute of Certified Public Accountants.

Anderson, J.C. and Frankle, A.W. (1980) 'Voluntary Social Reporting: An Iso-Beta Portfolio Analysis', *The Accounting Review*, 55(3), pp. 467-479.

Archer, S., Delvaille, P. and McLeay, S. (1995) 'The Measurement of Harmonisation and the Comparability of Financial Statement Items: Within-Country and Between-Country Effects', *Accounting & Business Research*, 25(98), pp. 67-80.

Ball, R. and Brown, P. (1968) 'An Empirical Evaluation of Accounting Income Numbers', *Journal of Accounting Research*, 6(2), pp. 159-178.

Baltagi, B.H. (2005) *Econometric Analysis of Panel Data*. Chichester: John Wiley and Sons Ltd.

Bao, B.H. and Chow, L. (1999) 'The Usefulness of Earnings and Book Value for Equity Valuation in Emerging Capital Markets: Evidence From Listed Companies in the People's Republic of China', *Journal of International Financial Management & Accounting*, 10(2), pp. 85-104.

Barth, M.E. (1991) 'Relative Measurement Errors among Alternative Pension Asset and Liability Measures', *The Accounting Review*, 66(3), pp. 433-463.

Barth, M.E., Beaver, W.H. and Landsman, W.R. (2001a) 'The relevance of the value relevance literature for financial accounting standard setting: another view', *Journal of Accounting & Economics*, 31(1-3), pp. 77-104.

Barth, M.E., Cram, D.P. and Nelson, K.K. (2001b) 'Accruals and the Prediction of Future Cash Flows', *The Accounting Review*, 76(1), pp. 27-58.

Bartov, E., Stephen, R.G. and Kim, M. (2005) 'Comparative Value Relevance Among German, U.S., and International Accounting Standards: A German Stock Market Perspective', *Journal of Accounting, Auditing & Finance*, 20(2), pp. 95-119.

Beattie, V. and Jones, M.J. (1997) 'A Comparative Study of the Use of Financial Graphs in the Corporate Annual Reports of Major U.S. and U.K. Companies', *Journal of International Financial Management & Accounting*, 8(1), pp. 33-68.

Beattie, V. and McInnes, B. (2006) *Briefing: Narrative reporting in the UK and the US – which system works best?* London: Centre for Business Performance, Institute of Chartered Accountants in England & Wales (ICAEW).

Beattie, V., McInnes, B. and Fearnley, S. (2004) 'A methodology for analysing and evaluating narratives in annual reports: a comprehensive descriptive profile and metrics for disclosure quality attributes', *Accounting Forum*, 28(3), pp. 205-239.

Beaver, W.H. and Engel, E.E. (1996) 'Discretionary behavior with respect to allowances for loan losses and the behavior of security prices', *Journal of Accounting & Economics*, 22(1-3), pp. 177-206.

Beaver, W.H., Kennelly, J.W. and Voss, W.M. (1968) 'Predictive Ability as a Criterion for the Evaluation of Accounting Data', *The Accounting Review*, 43(4), pp. 675-683.

Beck, A.C., Campbell, D. and Shrives, P.J. (2010) 'Content analysis in environmental reporting research: Enrichment and rehearsal of the method in a British-German context', *The British Accounting Review*, 42(3), pp. 207-222.

Belkaoui, A. (1980) 'The impact of socio-economic accounting statements on the investment decision: an empirical study', *Accounting, Organizations & Society*, 5(3), pp. 263-283.

Belkaoui, A. (1984) *Socio-economic Accounting*. London: Quorum.

Belkaoui, A. and Karpik, P.G. (1989) 'Determinants of the Corporate Decision to Disclose Social Information', *Accounting, Auditing & Accountability Journal*, 2(1), pp. 36-51.

Belkaoui, A.R. (2004) *Accounting Theory*. London: Thomson Learning.

Benbasat, I. and Dexter, A.S. (1986) 'An Investigation of the Effectiveness of Color and Graphical Information Presentation Under Varying Time Constraints', *MIS Quarterly*, 10(1), pp. 59-83.

Benjamin, J.J. and Stanga, K.G. (1977) 'Difference in disclosure needs of major users of financial statements', *Accounting & Business Research*, 7(27), pp. 187-192.

Benston, G.J., Bromwich, M. and Wagenhofer, A. (2006) 'Principles- Versus Rules-Based Accounting Standards: The FASB's Standard Setting Strategy', *ABACUS*, 42(2), pp. 165-188.

Brammer, S. and Pavelin, S. (2004) 'Voluntary social disclosures by large UK companies', *Business Ethics: A European Review*, 13(2-3), pp. 86-99.

Brammer, S. and Pavelin, S. (2006a) 'Factors Influencing the Quality of Corporate Environmental Disclosure', *Business Strategy and the Environment*, 17(2), pp. 120-136, *Wiley InterScience* [Online]. Available at: http://www3.interscience.wiley.com/cgi-bin/fulltext/112694234/PDFSTART (Accessed: 1 May 2007).

Brammer, S. and Pavelin, S. (2006b) 'Voluntary Environmental Disclosures by Large UK Companies', *Journal of Business Finance & Accounting*, 33(7-8), pp. 1168-1188.

Buhr, N. (1998) 'Environmental performance, legislation and annual report disclosure: the case of acid rain and Falconbridge', *Accounting, Auditing & Accountability Journal*, 11(2), pp. 163-190.

Buhr, N. and Freedman, M. (2001) 'Culture, Institutional Factors and Differences in Environmental Disclosure between Canada and the United States', *Critical Perspectives on Accounting*, 12(3), pp. 293-322.

Business in the Community (2004) *Benchmarking Responsible Business Practice: Corporate Responsibility and Business in the Environment Indices 2003*. London: Business in the Community.

Business in the Environment (2000) *Performance: Sustaining the Business Revolution: Business in the Environment Index of Corporate Environmental Engagement 1999 Survey*. London: Business in the Environment.

Business in the Environment (2002) *2001 Sustainability competitiveness: Business in the Environment 6th Index of Corporate Environmental Engagement*. London: Business in the Environment.

Business in the Environment (2003) *2002 Business in the Environment: 7th Index of Corporate Environmental Engagement*. London: Business in the Environment.

Butcher, K.R. (2006) 'Learning from Text with Diagrams: Promoting Mental Model Development and Inference Generation', *Journal of Educational Psychology*, 98(1), pp. 182-197.

Cameron, A.C. and Trivedi, P.K. (2010) *Microeconometrics Using Stata*. Texas: Stata Press.

Campbell, D. (2003) 'Intra- and Intersectoral Effects in Environmental Disclosures: Evidence for Legitimacy Theory?', *Business Strategy and the Environment*, 12(6), pp. 357-371.

Campbell, D. (2004) 'A longitudinal and cross-sectional analysis of environmental disclosure in UK companies – a research note', *The British Accounting Review*, 36(1), pp. 107-117.

Campbell, D. and Slack, R. (2011) 'Environmental disclosure and environmental risk: Sceptical attitudes of UK sell-side bank analysts', *The British Accounting Review*, 43(1), pp. 54-64.

Carney, R.N. and Levin, J.R. (2002) 'Pictorial Illustrations Still Improve Students' Learning From Text', *Educational Psychology Review*, 14(1), pp. 5-26.

Ceres (2006) *Investors Press S&P 500 Companies for Better Disclosure on Social and Environmental Challenges: New GRI Reporting Guidelines Draw Praise from Baxter, PPL* [Press release]. 5 October. Available at: http://www.ceres.org/press/press-releases/investors-press-sp500-companies-for-better-disclosure-on-social-and-environmental-challenges (Accessed 1 January 2012).

Cho, C.H. and Patten, D.M. (2007) 'The role of environmental disclosures as tools of legitimacy: A research note', *Accounting, Organizations & Society*, 32(7-8), pp. 639-647.

Cho, C.H. and Roberts, R.W. (2010) 'Environmental reporting on the internet by America's Toxic 100: Legitimacy and self-presentation', *International Journal of Accounting Information Systems*, 11(1), pp. 1-16.

Cho, C.H., Roberts, R.W. and Patten, D.M. (2010) 'The language of US corporate environmental disclosure', *Accounting, Organizations & Society*, 35(4), pp. 431-443.

Choi, B., Collins, D.W. and Johnson, B.W. (1997) 'Valuation Implications of Reliability Differences: The Case of Nonpension Postretirement Obligations', *The Accounting Review*, 72(3), pp. 351-383.

Clarke, J. and Gibson-Sweet, M. (1999) 'The use of corporate social disclosures in the management of reputation and legitimacy: a cross sectoral analysis of UK Top 100 Companies', *Business Ethics: A European Review*, 8(1), pp. 5-13.

Clarkson, P.M., Li, Y., Richardson, G.D. and Vasvari, F.P. (2008) 'Revisiting the relation between environmental performance and environmental disclosure: An empirical analysis', *Accounting, Organizations & Society*, 33(4-5), pp. 303-327.

Cooper, S.M. and Owen, D.L. (2007) 'Corporate social reporting and stakeholder accountability: The missing link', *Accounting, Organizations & Society*, 32(7-8), pp. 649-667.

Cordeiro, J.J. and Sarkis, J. (1997) 'Environmental Proactivism and Firm Performance: Evidence from Security Analyst Earnings Forecasts', *Business Strategy and the Environment*, 6(2), pp. 104-114.

Cormier, D. and Gordon, I.M. (2001) 'An examination of social and environmental reporting strategies', *Accounting, Auditing & Accountability Journal*, 14(5), pp. 587-617.

Cormier, D. and Magnan, M. (1999) 'Corporate Environmental Disclosure Strategies: Determinants, Costs and Benefits', *Journal of Accounting, Auditing & Finance*, 14(4), pp. 429-451.

Cormier, D. and Magnan, M. (2003) 'Environmental reporting management: a continental European perspective', *Journal of Accounting & Public Policy*, 22(1), pp. 43-62.

Cormier, D., Magnan, M. and van Velthoven, B. (2005) 'Environmental Disclosure Quality in Large German Companies: Economic Incentives, Public Pressures or Institutional Conditions?', *The European Accounting Review*, 14(1), pp. 3-39.

Courtis, J.K. (1986) 'An Investigation into Annual Report Readability and Corporate Risk-Return Relationships', *Accounting & Business Research*, 16(64), pp. 285-294.

Courtis, J.K. (1995) 'Readability of annual reports: Western versus Asian evidence', *Accounting, Auditing & Accountability Journal*, 8(2), pp. 4-17.

Courtis, J.K. (1998) 'Annual report readability variability: tests of the obfuscation hypothesis', *Accounting, Auditing & Accountability Journal*, 11(4), pp. 459-471.

Courtis, J.K. (2004) 'Corporate report obfuscation: artefact or phenomenon?', *The British Accounting Review*, 36(3), pp. 291-312.

Dechow, P.M. and Dichev, I.D. (2002) 'The Quality of Accruals and Earnings: The Role of Accrual Estimation Errors', *The Accounting Review*, 77(4, supplement), pp. 35-59.

Deegan, C. (2002) 'Introduction: The legitimising effect of social and environmental disclosures – a theoretical foundation', *Accounting, Auditing & Accountability Journal*, 15(3), pp. 282-311.

Deegan, C. and Blomquist, C. (2006) 'Stakeholder influence on corporate reporting: An exploration of the interaction between WWF-Australia and the Australian minerals industry', *Accounting, Organizations & Society*, 31(4-5), pp. 343-372.

Deegan, C. and Gordon, B. (1996) 'A Study of the Environmental Disclosure Practices of Australian Corporations', *Accounting & Business Research*, 26(3), pp. 187-199.

Deegan, C. and Rankin, M. (1996) 'Do Australian companies report environmental news objectively?: An analysis of environmental disclosures by firms prosecuted successfully by the Environmental Protection Authority', *Accounting, Auditing & Accountability Journal*, 9(2), pp. 50-67.

Deegan, C. and Rankin, M. (1997) 'The materiality of environmental information to users of annual reports', *Accounting, Auditing & Accountability Journal*, 10(4), pp. 562-583.

Deegan, C., Rankin, M. and Tobin, J. (2002) 'An examination of the corporate social and environmental disclosures of BHP from 1983-1997: A test of legitimacy theory', *Accounting, Auditing & Accountability Journal*, 15(3), pp. 312-343.

Deegan, C. and Unerman, J. (2006) *Financial Accounting Theory*. European Edition. Berkshire: McGraw-Hill Education.

DeFond, M.L. and Jiambalvo, J. (1994) 'Debt covenant violation and manipulation of accruals', *Journal of Accounting & Economics*, 17(1-2), pp. 145-176.

Denzin, N.K. and Lincoln, Y.S. (2011) 'Introduction: The Discipline and Practice of Qualitative Research', in Denzin, N.K. and Lincoln, Y.S. (ed.) *The SAGE Handbook of Qualitative Research*. California: SAGE Publications, Inc., pp. 1-19.

Department for Environment, Food and Rural Affairs (2006) *Environmental Key Performance Indicators: Reporting Guidelines for UK Business*. London: Department for Environment, Food and Rural Affairs.

DiMaggio, P.J. and Powell, W.W. (1983) 'The Iron Cage Revisited: Institutional Isomorphism and Collective Rationality in Organizational Fields', *American Sociological Review*, 48(2), pp. 147-160.

Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC *Official Journal L 275*, 25/10/2003, pp. 32-46.

Directive 2004/101/EC of the European Parliament and of the Council of 27 October 2004 amending Directive 2003/87/EC establishing a scheme for greenhouse gas emission allowance trading within the Community, in respect of the Kyoto Protocol's project mechanisms *Official Journal L 338*, 13/11/2004, pp. 18-23.

Directive 2006/12/EC of the European Parliament and of the Council of 5 April 2006 on waste *Official Journal L 114*, 27/04/2006, pp. 9-21.

Directive 2008/101/EC of the European Parliament and of the Council of 19 November 2008 amending Directive 2003/87/EC so as to include aviation activities in the scheme

for greenhouse gas emission allowance trading within the Community *Official Journal L 8*, 13/01/2009, pp. 3-21.

Directive 2009/29/EC of the European Parliament and of the Council of 23 April 2009 amending Directive 2003/87/EC so as to improve and extend the greenhouse gas emission allowance trading scheme of the Community *Official Journal L140*, 5/06/2009, pp. 63-87.

Dreyer, L.G. (1984) 'Readability and responsibility', *Journal of Reading*, 27(4, January), pp. 334-338.

Environmental Protection The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2006 (SI 2006/1463).

Epstein, M.J. (1992) 'The annual report card', *Business & Society Review*, 81(Spring92), pp. 81-83.

Epstein, M.J. and Freedman, M. (1994) 'Social Disclosure and the Individual Investor', *Accounting, Auditing & Accountability Journal*, 7(4), pp. 94-109.

European Commission (2001) *Green Paper: Promoting a European Framework for Corporate Social Responsibility*. Brussels: European Commission.

European Commission (2002) *Communication from the Commission concerning Corporate Social Responsibility: A Business Contribution to Sustainable Development*. Brussels: European Commission.

European Commission (2007a) *Corporate Social Responsibility: National public policies in the European Union*. Luxembourg: Office for Official Publications of the European Communities.

European Commission (2007b) *What is the Eco-label?*. [Online]. Available at: http://ec.europa.eu/environment/ecolabel/whats_eco/index_en.htm (Accessed: 2 May 2008).

Fillippatou, D. and Pumfrey, P.D. (1996) 'Pictures, Titles, Reading Accuracy and Reading Comprehension: A Research Review', *Educational Research*, 38(3), pp. 259-291.

Financial Accounting Standards Board (1975) *Accounting for Contingencies: Statement No. 5*. Norwalk, Connecticut: Financial Accounting Standards Board.

Financial Accounting Standards Board (1978) *Statement of Financial Accounting Concepts No.1 Objectives of Financial Reporting by Business Enterprises.* Norwalk, Connecticut: Financial Accounting Standards Board.

Financial Accounting Standards Board (1980) *Statement of Financial Accounting Concepts No.2 Qualitative Characteristics of Accounting Information.* Norwalk, Connecticut: Financial Accounting Standards Board.

Flesch, R. (1948) 'A New Readability Yardstick', *Journal of Applied Psychology*, 32(3), pp. 221-233.

Francis, J. and Schipper, K. (1999) 'Have Financial Statements Lost Their Relevance?', *Journal of Accounting Research*, 37(2), pp. 319-352.

Freedman, M. and Jaggi, B. (1992) 'An investigation of the long-run relationship between pollution performance and economic performance: The case of pulp and paper firms', *Critical Perspectives on Accounting*, 3(4), pp. 315-336.

Freedman, M. and Wasley, C. (1990) 'The Association between Environmental Performance and Environmental Disclosure in Annual Reports and 10-Ks', *Advances in Public Interest Accounting*, 3, pp. 183-193.

Friedman, M. (1970) 'A Friedman Doctrine – The Social Responsibility of Business is to Increase its Profits', *The New York Times Magazine*, 13 September [Online]. Available at: http://select.nytimes.com/gst/abstract.html?res=F10F11FB3E5810718EDDAA0994D14

05B808BF1D3&scp=1&sq=The+Social+Responsibility+of+Business+is+to+Increase+its+Profits.+&st=p (Accessed 26 March 2007).

Gamble, G.O., Hsu, K., Jackson, C. and Tollerson, C.D. (1996) 'Environmental Disclosures in Annual Reports: An International Perspective', *The International Journal of Accounting*, 31(3), pp. 293-331.

Gamble, G.O., Hsu, K., Kite, D. and Radtke, R.R. (1995) 'Environmental Disclosures In Annual Reports and 10Ks: An Examination', *Accounting Horizons*, 9(3), pp. 34-54.

Global Reporting Initiative (2000) *Sustainability Reporting Guidelines on Economic, Environmental and Social Performance*. Boston: Global Reporting Initiative.

Global Reporting Initiative (2002) *Sustainability Reporting Guidelines*. Boston: Global Reporting Initiative.

Global Reporting Initiative (2003) *GRI Telecommunications Sector Supplement: For use with the GRI 2002 Sustainability Reporting Guidelines*. [Online]. Available at: http://www.globalreporting.org/ReportingFramework/ReportingFrameworkDownloads (Accessed: 10 August 2008).

Global Reporting Initiative (2005a) *Financial Services Sector Supplement: Environmental Performance Pilot Version 1.0: For use with the GRI 2002 Sustainability Reporting Guidelines*. [Online]. Available at: http://www.globalreporting.org/ReportingFramework/ReportingFrameworkDownloads (Accessed: 10 August 2008).

Global Reporting Initiative (2005b) *GRI Mining and Metals Sector Supplement Pilot Version 1.0: Incorporating an abridged version of the GRI 2002 Sustainability Reporting Guidelines*. [Online]. Available at: http://www.globalreporting.org/ReportingFramework/ReportingFrameworkDownloads (Accessed: 10 August 2008).

Global Reporting Initiative (2006a) *GRI Logistics and Transportation Sector Supplement Pilot Version 1.0: Incorporating and abridged version of the GRI 2002 Sustainability Reporting Guidelines.* [Online]. Available at: http://www.globalreporting.org/ReportingFramework/ReportingFrameworkDownloads (Accessed: 10 August 2008).

Global Reporting Initiative (2006b) *Sustainability Reporting Guidelines.* Amsterdam: Global Reporting Initiative.

Global Reporting Initiative (2007) *Sustainability Reporting Guidelines & Electric Utility Sector Supplement Version Pilot.* [Online]. Available at: http://www.globalreporting.org/ReportingFramework/ReportingFrameworkDownloads (Accessed: 10 August 2008).

Global Reporting Initiative (2008a) *A Snapshoot of Sustainability Reporting in the Construction and Real Estate Sector.* [Online]. Available at: http://www.globalreporting.org/ReportingFramework/ReportingFrameworkDownloads (Accessed: 6 March 2009).

Global Reporting Initiative (2008b) *Sustainability Reporting in the Food Processing Sector: A survey conducted by the Global Reporting Initiative.* [Online]. Available at: http://www.globalreporting.org/ReportingFramework/ReportingFrameworkDownloads (Accessed: 6 March 2009).

Global Reporting Initiative (2011) *Sustainability Reporting Guidelines.* Amsterdam: Global Reporting Initiative.

Graham, A., Maher, J.J. and Northcut, W.D. (2000) 'Environmental Liability Information and Bond Ratings', *Journal of Accounting, Auditing & Finance*, 16(2) pp. 93-116.

Gray, R. (2006) 'Does sustainability reporting improve corporate behaviour?: Wrong question? Right time?', *Accounting & Business Research*, 36(1), pp. 65-88.

Gray, R.H., Owen, D.L. and Adams, C. (1996) *Accounting and accountability: changes and challenges in corporate social and environmental reporting*. London: Prentice Hall.

Gray, R., Javad, M., Power, D.M. and Sinclair, C.D. (2001) 'Social and Environmental Disclosure and Corporate Characteristics: A Research Note and Extension', *Journal of Business Finance & Accounting*, 28(3-4), pp. 327-356.

Gray, R., Kouhy, R. and Lavers, S. (1995) 'Corporate social and environmental reporting: A review of the literature and a longitudinal study of UK disclosure', *Accounting, Auditing & Accountability Journal*, 8(2), pp. 47-77.

Gray, R., Owen, D. and Maunders, K. (1987) *Corporate Social Reporting: Accounting and Accountability*. London: Prentice-Hall.

Gray, S.J. (1988) 'Towards a Theory of Cultural Influence on the Development of Accounting Systems Internationally', *Abacus*, 24(1), pp. 1-15.

Gray, S.J., Radebaugh, L.H. and Roberts, C.B. (1990) 'International Perceptions of Cost Constraints on Voluntary Information Disclosures: A Comparative Study of U.K. And U.S. Multinationals', *Journal of International Business Studies*, 21(4), pp. 597-622.

Great Britain. *Companies Act 2006: Elizabeth II. Chapter 46* (2006) London: The Stationery Office.

Green, P.L. (2006) 'Environmental Impact', *Global Finance*, 20(8), pp. 28-29.

Greene, W.H. (2003) *Econometric Analysis*. 5th ed. New Jersey: Pearson Education, Inc.

Guba, E.G. (1990) 'The Alternative Paradigm Dialog', in Guba, E.G. (ed.) *The Paradigm Dialog*. Newbury Park, California: SAGE Publications, Inc., pp. 17-30.

Gunning, R. (1968) 'The Fog Index After Twenty Years', *Journal of Business Communication*, 6(2), pp. 3-13.

Guthrie, J. and Parker, L.D. (1989) 'Corporate Social Reporting: A Rebuttal of Legitimacy Theory', *Accounting & Business Research*, 19(76), pp. 343-352.

Guthrie, J. and Parker, L.D. (1990) 'Corporate Social Disclosure Practice: A Comparative International Analysis', *Advances in Public Interest Accounting*, 3, pp. 159-175.

Hackston, D. and Milne, M.J. (1996) 'Some determinants of social and environmental disclosures in New Zealand companies', *Accounting, Auditing & Accountability Journal*, 9(1), pp. 77-108.

Hammond, K. and Miles, S. (2004) 'Assessing quality assessment of corporate social reporting: UK perspectives', *Accounting Forum*, 28(1), pp. 61-79.

Hand, J.R.M. (2005) 'The Value Relevance of Financial Statements in the Venture Capital Market', *The Accounting Review*, 80(2), pp. 613-648.

Hart, S.L. and Ahuja, G. (1996) 'Does It Pay to be Green?: An Empirical Examination of the Relationship between Emission Reduction and Firm Performance', *Business Strategy and the Environment*, 5(1), pp. 30-37.

Harte, G., Lewis, L. and Owen, D. (1991) 'Ethical investment and the corporate reporting function', *Critical Perspectives on Accounting*, 2(3), pp. 227-253.

Harte, G. and Owen, D. (1991) 'Environmental Disclosure in the Annual Reports of British Companies: A Research Note', *Accounting, Auditing & Accountability Journal*. 4(3), pp. 51-61.

Hasseldine, J., Salama, A.I. and Toms, J.S. (2005) 'Quantity versus quality: the impact of environmental disclosures on the reputations of UK Plcs', *The British Accounting Review*, 37(2), pp. 231-248.

Healy, P.M. (1985) 'The Effect of Bonus Schemes on Accounting Decisions', *Journal of Accounting & Economics*, 7(1-3), pp. 85-107.

Hemphill, T.A. (1997) 'Legislating corporate social responsibility', *Business Horizons*, 40(2), pp. 53-58.

Ho, L-C.J. and Taylor, M.E. (2007) 'An Empirical Analysis of Triple Bottom-Line Reporting and its Determinants: Evidence from the United States and Japan', *Journal of International Financial Management & Accounting*, 18(2), pp. 122-150.

Hoffman, A.J. (1999) 'Institutional Evolution and Change: Environmentalism and the U.S. Chemical Industry', *Academy of Management Journal*, 42(4), pp. 351-371.

Holland, L. and Boon Foo, Y. (2003) 'Differences in environmental reporting practices in the UK and the US: the legal and regulatory context', *The British Accounting Review*, 35(1), pp. 1-18.

Hooghiemstra, R. (2000) 'Corporate Communication and Impression Management – New Perspectives Why Companies Engage in Corporate Social Reporting', *Journal of Business Ethics*, 27(1-2), pp. 55-68.

Hughes, S.B., Anderson, A. and Golden S. (2001) 'Corporate environmental disclosures: are they useful in determining environmental performance?', *Journal of Accounting & Public Policy*, 20(3), pp. 217-240.

Imhoff, E.A. and Lobo, G.J. (1984) 'Information Content of Analysts' Forecast Revisions', *Journal of Accounting Research*, 22(2), pp. 541-554.

Ingram, R.W. (1978) 'An Investigation of the Information Content of (Certain) Social Responsibility Disclosures', *Journal of Accounting Research*, 16(2), pp. 270-285.

International Accounting Standards Board (2001) *Framework for the Preparation and Presentation of Financial Statements. CCH* [Online]. Available at: http://www.cchinformation.com/ (Accessed: 23 April 2007).

International Finance Corporation (2006) *International Finance Corporation's Policy on Social & Environmental Sustainability*. Washington, D.C.: International Finance Corporation.

Internet Archive (2001) *Archived Results from Jan 01, 1996 – Latest*. Available at: http://web.archive.org/web/*/http://kelda.co.uk (Accessed: 18 November 2010).

Jaggi, B. and Freedman, M. (1992) 'An Examination of the Impact of Pollution Performance on Economic and Market Performance: Pulp and Paper Firms', *Journal of Business Finance & Accounting*, 19(5), pp. 697-713.

Jarvenpaa, S.L. and Dickson, G.W. (1988) 'Graphics and Managerial Decision Making: Research Based Guidelines', *Communications of the ACM*, 31(6), pp. 764-774.

Jones, M.J. (1988) 'A Longitudinal Study of the Readability of the Chairman's Narratives in the Corporate Reports of a UK Company', *Accounting & Business Research*, 18(72), pp. 297-305.

Jones, M.J. and Shoemaker, P.A. (1994) 'Accounting Narratives: A Review of Empirical Studies of Content and Readability', *Journal of Accounting Literature*, 13, pp. 142-184.

Jorion, P. (2002) 'How Informative Are Value-at-Risk Disclosures?', *The Accounting Review*, 77(4), pp. 911-931.

Jose, A. and Lee, S.M. (2006) 'Environmental Reporting of Global Corporations: A Content Analysis based on Website Disclosures', *Journal of Business Ethics*, 72(4), pp. 307-321.

Keller, T., Gerjets, P., Scheiter, K. and Garsoffky, B. (2006) 'Information visualizations for knowledge acquisition: The impact of dimensionality and color coding', *Computers in Human Behavior*, 22(1), pp. 43-65.

KPMG (2002) *KPMG International Survey of Corporate Sustainability Reporting 2002*. De Meern: KPMG Global Sustainability Services.

KPMG (2005) *KPMG International Survey of Corporate Responsibility Reporting 2005*. Amsterdam: University of Amsterdam and KPMG Global Sustainability Services.

Larkin, J.H. and Simon, H.A. (1987) 'Why Diagram is (Sometimes) Worth Ten Thousand Words', *Cognitive Science*, 11(1), pp. 65-99.

Levie, W.H. and Lentz, R. (1982) 'Effects of Texts Illustrations: A Review of Research', *Educational Communication and Technology*, 30(4), pp. 195-232.

Lewis, N.R., Parker, L.D., Pound, G.D. and Sutcliffe, P. (1986) 'Accounting Report Readability: The Use of Readability Techniques', *Accounting & Business Research*, 16(63), pp. 199-213.

Li, F. (2008) 'Annual report readability, current earnings, and earnings persistence', *Journal of Accounting & Economics*, 45(2-3), pp. 221-247.

Lindblom, C.K. (1994) 'The implications of organizational legitimacy for corporate social performance and disclosure', *Critical Perspectives on Accounting Conference*. New York: Critical Perspectives on Accounting.

Liu, C., Ryan, S. and Tan, H. (2004) 'How Banks' Value-at-Risk Disclosures Predict their Total and Priced Risk: Effects of Bank Technical Sophistication and Learning over Time', *Review of Accounting Studies*, 9(2-3), pp. 265-294.

Logsdon, J.M. (1985) 'Organizational responses to environmental issues', in Preston, L.E. (ed.) *Research in Corporate Social Performance and Policy: A Research Annual*. Greenwich, Connecticut: JAI Press Inc., pp. 47-71.

Lynch, B. (2010) 'An examination of environmental reporting by Australian state government departments', *Accounting Forum*, 34(1), pp. 32-45.

Maines, L.A. and Wahlen, J.M. (2006) 'The Nature of Accounting Information Reliability: Inferences from Archival and Experimental Research', *Accounting Horizons*, 20(4), pp. 399-425.

Mathews, M.R. (1993) *Socially Responsible Accounting*. London: Chapman Hall.

Mathews, M.R. (1997) 'Twenty-five years of social and environmental accounting research: Is there a silver jubilee to celebrate?', *Accounting, Auditing & Accountability Journal*, 10(4), pp. 481-531.

Mayer, R.E. and Anderson, R.B. (1992) 'The Instructive Animation: Helping Students Build Connections between Words and Pictures in Multimedia Learning', *Journal of Educational Psychology*, 84(4), pp. 444-452.

Mayer, R.E. and Gallini, J.K. (1990) 'When Is an Illustration Worth Ten Thousand Words?', *Journal of Educational Psychology*, 82(4), pp. 715-726.

McNichols, M. and Wilson, G.P. (1988) 'Evidence of Earnings Management from the Provision for Bad Debts', *Journal of Accounting Research*, 26 (3, Supplement), pp. 1-31.

McWilliams, A. and Siegel, D. (2000) 'Corporate Social Responsibility and Financial Performance: Correlation or Misspecification?', *Strategic Management Journal*, 21(5), pp. 603-609.

McWilliams, A. and Siegel, D. (2001) 'Corporate Social Responsibility: A Theory of the Firm Perspective', *Academy of Management Review*, 26(1), pp. 117-127.

Microsoft Corporation (2008) *Readability scores*. Available at: http://office.microsoft.com/assistance/hfws.aspx?AssetID=HP051863181033&CTT=1&Origin=EC010227221033&QueryID=PM2DuKLRt0&respos=2&rt=2 (Accessed: 20 February 2008).

Miles, S., Hammond, K and Friedman, K.L. (2002) *Social and Environmental Reporting and Ethical Investment*. London: The Association of Chartered Certified Accountants.

Milne, M.J. and Adler, R.W. (1999) 'Exploring the reliability of social and environmental disclosures content analysis', *Accounting, Auditing & Accountability*, 12(2), pp. 237-256.

Murray, A., Sinclair, D., Power, D. and Gray, R. (2006) 'Do financial markets care about social and environmental disclosure?', *Accounting, Auditing & Accountability Journal*, 19(2), pp. 228-255.

Neu, D., Warsame, H. and Pedwell, K. (1998) 'Managing Public Impressions: Environmental Disclosures in Annual Reports', *Accounting, Organizations & Society*, 23(3), pp. 265-282.

O'Donovan, G. (2002) 'Environmental disclosures in the annual report: Extending the applicability and predictive power of legitimacy theory', *Accounting, Auditing & Accountability Journal*, 15(3), pp. 344-371.

Organisation for Economic Co-Operation and Development (2011) *OECD Guidelines for Multinational Enterprises: Recommendations for Responsible Business Conduct in a Global Context*. [Online]. OECD. Available at: http://www.oecd.org/document/28/0,3746,en_2649_34889_2397532_1_1_1_1,00.html (Accessed: 25 July 2011).

Orlitzky, M., Schmidt, F.L. and Rynes, S.L. (2003) 'Corporate Social and Financial Performance: A Meta-Analysis', *Organization Studies*, 24(3), pp. 403-441.

Oxford Economic Research Associates Environmental Ltd. (2000) *Accounting for the environment: An analysis of the quality of environmental reporting across the food and retail, oil and gas, utilities, and banking sectors*. Oxford: OXERA Environmental Ltd.

Patten, D.M. (1991) 'Exposure, Legitimacy, and Social Disclosure', *Journal of Accounting & Public Policy*, 10(4), pp. 297-308.

Patten, D.M. (1992) 'Intra-Industry Environmental Disclosures in Response to the Alaskan Oil Spill: A Note on Legitimacy Theory', *Accounting, Organizations & Society*, 17(5), pp. 471-475.

Patten, D.M. (1995) 'Variability in Social Disclosure: A Legitimacy-Based Analysis', *Advances in Public Interest Accounting*, 6, pp. 273-285.

Patten, D.M. (2002a) 'The relation between environmental performance and environmental disclosure: a research note', *Accounting, Organizations & Society*, 27(8), pp. 763-773.

Patten, D.M. (2002b) 'Media exposure, public policy pressure, and environmental disclosure: an examination of the impact of tri data availability', *Accounting Forum*, 26(2), pp. 152-161.

Perks, R.W. (1993) *Accounting and Society*. London: Chapman Hall.

Petroni, K.R. (1992) 'Optimistic reporting in the property-casualty insurance industry', *Journal of Accounting & Economics*, 15(4), pp. 485-508.

Rahaman, A.S., Lawrence, S. and Roper, J. (2004) 'Social and environmental reporting at the VRA: institutionalised legitimacy or legitimation crisis?', *Critical Perspectives on Accounting*, 15(1), pp. 35-56.

Rajgopal, S. (1999) 'Early Evidence on the Informativeness of the SEC's Market Risk Disclosures: The Case of Commodity Price Risk Exposure of Oil and Gas Producers', *The Accounting Review*, 74(3), pp. 251-280.

Readance, J.E. and Moore, D.W. (1981) 'A Meta-Analytic Review of the Effect of Adjunct Pictures on Reading Comprehension', *Psychology in the Schools*, 18(2), pp. 218-224.

Rezaee, Z., Szendi, J.Z. and Aggarwal, R. (1995) 'Corporate governance and accountability for environmental concerns', *Managerial Auditing Journal*, 10(8), pp. 27-33.

Riahi-Belkaoui, A. (2004) *Accounting Theory*. 5th edn. London: Thomson Learning.

Richardson, A.J. and Welker, M. (2001) 'Social disclosure, financial disclosure and the cost of equity capital', *Accounting, Organizations & Society*, 26(7-8), pp. 597-616.

Roberts, R.W. (1992) 'Determinants of Corporate Social Responsibility Disclosure: An Application of Stakeholder Theory', *Accounting, Organizations & Society*, 17(6), pp. 595-612.

Robinson, D.H., Katayama, A.D., DuBois, N.F. and Devaney, T. (1998) 'Interactive Effects of Graphic Organizers and Delayed Review of Concept Application', *Journal of Experimental Education*, 67(1), pp. 17-31.

Rockness, J. (1985) 'An Assessment of the Relationship between US Corporate Environmental Performance and Disclosure', *Journal of Business Finance & Accounting*, 12(3), pp. 339-354.

Rockness, J. and Williams, P.F. (1988) 'A descriptive study of social accounting responsibility mutual funds', *Accounting, Organizations & Society*, 13(4), pp. 397-411.

Roner, L. (2007) 'Climate risk – Acts of God on the books', *ClimateChangeCorp.com: Reporting*, 13 November [Online]. Available at: http://www.climatechangecorp.com/content.asp?ContentID=5002 (Accessed: 14 November 2007).

SAM Indexes GmbH. (2006) *Dow Jones Sustainability Indexes In Collaboration With SAM*. Available at: http://www.sustainability-index.com/06_htmle/indexes/overview.html (Accessed: 6 April 2007).

Schipper, K. and Vincent, L. (2003) 'Earnings Quality', *Accounting Horizons*, 17(supplement), pp. 97-110.

Schrand, C.M. (1997) 'The Association between Stock-Price Interest Rate Sensitivity and Disclosures about Derivative Instruments', *The Accounting Review*, 72(1), pp. 87-109.

Schroeder, N. and Gibson, C. (1990) 'Readability of Management's Discussion and Analysis', *Accounting Horizons*, 4(4), pp. 78-87.

Securities and Exchange Commission (2008) *Part 229 Standard Instructions for Filing Forms Under Securities Act of 1933, Securities Exchange Act of 1934 and Energy Policy and Conservation Act of 1975 – Regulation S-K*. Washington, D.C.: Securities and Exchange Commission.

Shah, P., Mayer, R.E. and Hegarty, M. (1999) 'Graphs as Aids to Knowledge Construction: Signalling Techniques for Guiding the Process of Graph Comprehension', *Journal of Educational Psychology*, 91(4), pp. 690-702.

Smith, J.E. and Smith, N.P. (1971) 'Readability: A Measure of the Performance of the communication Function of Financial Reporting', *The Accounting Review*, 46(3), pp. 552-561.

Smith, M. and Taffler, R. (1992) 'Readability and Understandability: Different Measures of the Textual Complexity of Accounting Narrative', *Accounting, Auditing & Accountability Journal*, 5(4), pp. 84-98.

Solomon, A. (2000) 'Could corporate environmental reporting shadow financial reporting?', *Accounting Forum*, 24(1), pp. 30-55.

Solomon, J.F. and Solomon, A. (2006) 'Private social, ethical and environmental disclosure', *Accounting, Auditing & Accountability Journal*, 19(4), pp. 564-591.

Speier, C. (2006) 'The influence of information presentation formats on complex task decision-making performance', *International Journal of Human-Computer Studies*, 64(11), pp. 1115-1131.

Still, M.D. (1972) 'The Readability of Chairman's Statements', *Accounting & Business Research*, 2(winter), pp. 36-39.

Sweeney, A.P. (1994) 'Debt covenant violations and managers' accounting responses', *Journal of Accounting & Economics*, 17(3), pp. 281-308.

The Association of Chartered Certified Accountants (1999) *Environmental Reporting Awards: Report of the Judges*. London: The Certified Accountants Educational Trust (CAET).

The Association of Chartered Certified Accountants (2005) *Report of the judges: ACCA UK Awards for Sustainability Reporting 2004*. London: The Certified Accountants Educational Trust (CAET).

The Association of Chartered Certified Accountants (2007) *Report of the judges: ACCA UK Awards for Sustainability Reporting 2007*. London: The Certified Accountants Educational Trust (CAET).

The European Federation of Accountants (2000) *Towards a Generally Accepted Framework for Environmental Reporting*. Brussels: The Environmental Working Party of the European Federation of Accountants.

Tilt, C.A. (1994) 'The Influence of External Pressure Groups on Corporate Social Disclosure: Some Empirical Evidence', *Accounting, Auditing & Accountability Journal*, 7(4), pp. 47-72.

Tilt, C.A. (2008) 'Environmental disclosure outside the annual report', *International Journal of Management and Decision Making*, 9(3), pp. 288-309.

Toms, J.S. (2002) 'Firms Resources, Quality Signals and the Determinants of Corporate Environmental Reputation: Some UK Evidence', *The British Accounting Review*, 34(3), pp. 257-282.

Ullmann, A.A. (1985) 'Data in Search of a Theory: a Critical Examination of the Relationships among Social Performance, Social Disclosure and Economic Performance of U.S. Firms', *Academy of Management Review*, 10(3), pp. 540-557.

Unerman, J. (2000) 'Methodological issues: Reflections on quantification in corporate social reporting content analysis', *Accounting, Auditing & Accountability Journal*, 13(5), pp. 667-680.

Unerman, J. and Bennett, M. (2004) 'Increased stakeholder dialogue and the internet: towards greater corporate accountability or reinforcing capitalist hegemony?', *Accounting, Organizations & Society*, 29(7), pp. 685-707.

United Nations (2002) *International Standard Industrial Classification of All Economic Activities (ISIC) Revision 3.1*. New York: United Nations Publication.

United Nations (2010a) *Composition of macro geographical (continental) regions, geographical sub-regions, and selected economic and other groupings.* [Online]. Available at: http://millenniumindicators.un.org/unsd/methods/m49/m49regin.htm (Accessed: 26 November 2010).

United Nations (2010b) *United Nations Global Compact After the Signature: A Guide to Engagement in the United Nations Global Compact*. [Online]. Available at: http://www.unglobalcompact.org/AboutTheGC/ (Accessed: 25 July 2011).

United Nations Environment Programme (2006) *Global Framework for Climate Risk Disclosure: A statement of investor expectations for comprehensive corporate disclosure*. [Online]. Available at: http://www.uncclearn.org/global_framework_climate_risk_disclosure_statement (Accessed: 1 January 2012).

United States. *Sarbanes-Oxley Act of 2002: The Senate and House of Representatives of the United States of America in Congress. Public Law 107-204* (2002) Washington, D.C.: United States Government Printing Office.

Vafeas, N., Trigeorgis, J. and Geogiou, X. (1998) 'The usefulness of earnings in explaining stock returns in an emerging market: the case of Cyprus', *The European Accounting Review*, 7(1), pp. 105-124.

van der Laan Smith, J., Adhikari, A. and Tondkar, R.H. (2005) 'Exploring differences in social disclosures internationally: A stakeholder perspective', *Journal of Accounting & Public Policy*, 24(2), pp. 123-151.

van der Tas, L.G. (1992) 'Evidence of EC financial reporting practice harmonization: The case of deferred taxation', *The European Accounting Review*, 1(1), pp. 69-104.

van Staden, C.J. and Hooks, J. (2007) 'A comprehensive comparison of corporate environmental reporting and responsiveness', *The British Accounting Review*, 39(3), pp. 197-210.

Vekiri, I. (2002) 'What Is the Value of Graphical Displays in Learning?', *Educational Psychology Review*, 14(3), pp. 261–312.

Waddock, S.A. and Graves, S.B. (1997) 'The Corporate Social Performance-Financial Performance Link', *Strategic Management Journal*, 8(14), pp. 303-319.

Walden, W.D. and Schwartz, B.N. (1997) 'Environmental Disclosures and Public Policy Pressure', *Journal of Accounting & Public Policy*, 16(2), pp. 125-154.

Watts, R.L. and Zimmerman, J.L. (1978) 'Towards a Positive Theory of the Determination of Accounting Standards', *The Accounting Review*, 53(1), pp. 112-134.

Watts, R.L. and Zimmerman, J.L. (1990) 'Positive Accounting Theory: A Ten Year Perspective', *The Accounting Review*, 65(1), pp. 259-285.

Weetman, P., Jones, E.A.E., Adams C.A. and Gray, S.J. (1998) 'Profit Measurement and UK Accounting Standards: A Case of Increasing Disharmony in Relation to US GAAP and IASs', *Accounting & Business Research*, 28(3), pp. 189-208.

Williams, S.M. and Pei, C.A.H.W. (1999) 'Corporate Social Disclosures by Listed Companies on Their Web Sites: An International Comparison', *The International Journal of Accounting*, 34(3), pp. 389-419.

Wilmshurst, T.D. and Frost, G.R. (2000) 'Corporate environmental reporting: A test of legitimacy theory', *Accounting, Auditing & Accountability Journal*, 13(1), pp. 10-26.

Wiseman, J.W. (1982) 'An Evaluation of Environmental Disclosures Made in Corporate Annual Reports', *Accounting, Organizations & Society*, 7(1), pp. 53-63.

Yongvanich, K. and Guthrie, J. (2005) 'Extended performance reporting: an examination of the Australian mining industry', *Accounting Forum*, 29(1), pp. 103-119.

Yu, J. and Bell, J.N.B. (2007) 'Building a Sustainable Business in China's Small and Medium-Sized Enterprises (SMEs)', *Journal of Environmental Assessment Policy and Management*, 9(1), pp. 19-43.

Zeghal, D. and Ahmed, S.A. (1990), 'Comparison of Social Responsibility Information Disclosure Media Used by Canadian Firms', *Accounting, Auditing & Accountability Journal*, 3(1), pp. 38-53.

Appendices

Appendix 1: List of Sample Firms

Full Sample	Restricted Sample	Additional Restricted Sample[a]	Sample Firms	17-Code ISIC Rev.3.1	Two-Digit ISIC Rev.3.1
United Kingdom					
1	1	1	Anglo American plc	C Mining and quarrying	10 Mining of coal and lignite; extraction of peat
2	2	2	BHP Billiton plc	C Mining and quarrying	10 Mining of coal and lignite; extraction of peat
3	3	3	Royal Dutch Shell plc	C Mining and quarrying	11 Extraction of crude petroleum and natural gas; service activities incidental to oil and gas extraction, excluding surveying
4	4	4	BG Group plc	C Mining and quarrying	11 Extraction of crude petroleum and natural gas; service activities incidental to oil and gas extraction, excluding surveying
5	5	5	Cairn Energy plc	C Mining and quarrying	11 Extraction of crude petroleum and natural gas; service activities incidental to oil and gas extraction, excluding surveying
6	6	6	Rio Tinto plc	C Mining and quarrying	13 Mining of metal ores
7	7	7	Xstrata plc	C Mining and quarrying	13 Mining of metal ores
8			Kazakhmys plc	C Mining and quarrying	13 Mining of metal ores
9			Antofagasta plc	C Mining and quarrying	13 Mining of metal ores
10	8	8	Diageo plc	D Manufacturing	15 Manufacture of food products and beverages
11		9	Unilever plc	D Manufacturing	15 Manufacture of food products and beverages
12	9[b]	10[b]	SABMiller plc	D Manufacturing	15 Manufacture of food products and beverages
13	10[c]	11[c]	Scottish & Newcastle plc	D Manufacturing	15 Manufacture of food products and beverages

Full Sample	Restricted Sample	Additional Restricted Sample[a]	Sample Firms	17-Code ISIC Rev.3.1	Two-Digit ISIC Rev.3.1
14			Tate & Lyle plc	D Manufacturing	15 Manufacture of food products and beverages
15	11	12	Associated British Foods plc	D Manufacturing	15 Manufacture of food products and beverages
16	12	13	British American Tobacco plc	D Manufacturing	16 Manufacture of tobacco products
17	13	14	Imperial Tobacco Group plc	D Manufacturing	16 Manufacture of tobacco products
18[b]	14[b]	15[b]	Gallaher Group plc	D Manufacturing	16 Manufacture of tobacco products
19	15	16	Reed Elsevier plc	D Manufacturing	22 Publishing, printing and reproduction of recorded media
20	16[c]	17[c]	Pearson plc	D Manufacturing	22 Publishing, printing and reproduction of recorded media
21	17	18	BP plc	D Manufacturing	23 Manufacture of coke, refined petroleum products and nuclear fuel
22	18	19	GlaxoSmithKline plc	D Manufacturing	24 Manufacture of chemicals and chemical products
23	19	20	AstraZeneca plc	D Manufacturing	24 Manufacture of chemicals and chemical products
24	20[c]	21[c]	Reckitt Benckiser plc	D Manufacturing	24 Manufacture of chemicals and chemical products
25			Imperial Chemical Industries plc	D Manufacturing	24 Manufacture of chemicals and chemical products
26	21	22	Shire plc	D Manufacturing	24 Manufacture of chemicals and chemical products
27	22	23	Johnson Matthey plc	D Manufacturing	24 Manufacture of chemicals and chemical products
28[b]			Hanson plc	D Manufacturing	26 Manufacture of other non-metallic mineral products
29			Rexam plc	D Manufacturing	28 Manufacture of fabricated metal products, except machinery and equipment
30			Smiths Group plc	D Manufacturing	33 Manufacture of medical, precision and optical instruments, watches and clocks
31			Smith & Nephew plc	D Manufacturing	33 Manufacture of medical, precision and optical instruments, watches and clocks
32	23[b]	24[b]	BAE Systems plc	D Manufacturing	35 Manufacture of other transport equipment
33	24[b]	25[b]	Rolls-Royce Group plc	D Manufacturing	35 Manufacture of other transport equipment
34	25	26	National Grid plc	E Electricity, gas and water supply	40 Electricity, gas, steam and hot water supply
35	26	27	Scottish & Southern Energy plc	E Electricity, gas and water supply	40 Electricity, gas, steam and hot water supply
36	27	28	Centrica plc	E Electricity, gas and water supply	40 Electricity, gas, steam and hot water supply

Full Sample	Restricted Sample	Additional Restricted Sample[a]	Sample Firms	17-Code ISIC Rev.3.1	Two-Digit ISIC Rev.3.1
37	28	29[b]	Scottish Power plc	E Electricity, gas and water supply	40 Electricity, gas, steam and hot water supply
38			International Power plc	E Electricity, gas and water supply	40 Electricity, gas, steam and hot water supply
39	29[c]	30[c]	United Utilities plc	E Electricity, gas and water supply	41 Collection, purification and distribution of water
40	30	31	Severn Trent plc	E Electricity, gas and water supply	41 Collection, purification and distribution of water
41			Kelda Group plc	E Electricity, gas and water supply	41 Collection, purification and distribution of water
42			Persimmon plc	F Construction	45 Construction
43	31[b]	32[b]	Cadbury Schweppes plc	G Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods	51 Wholesale trade and commission trade, except of motor vehicles and motorcycles
44			Wolseley plc	G Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods	51 Wholesale trade and commission trade, except of motor vehicles and motorcycles
45	32	33	Tesco plc	G Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods	52 Retail trade, except of motor vehicles and motorcycles; repair of personal and household goods
46	33	34	Marks & Spencer Group plc	G Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods	52 Retail trade, except of motor vehicles and motorcycles; repair of personal and household goods
47	34	35	Alliance Boots/Boots Group plc	G Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods	52 Retail trade, except of motor vehicles and motorcycles; repair of personal and household goods
48	35	36	J Sainsbury plc	G Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods	52 Retail trade, except of motor vehicles and motorcycles; repair of personal and household goods
49			Wm Morrison Supermarkets plc	G Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods	52 Retail trade, except of motor vehicles and motorcycles; repair of personal and household goods
50	36[c]	37[c]	Kingfisher plc	G Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods	52 Retail trade, except of motor vehicles and motorcycles; repair of personal and household goods
51			Next plc	G Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods	52 Retail trade, except of motor vehicles and motorcycles; repair of personal and household goods
52			DSG international plc	G Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods	52 Retail trade, except of motor vehicles and motorcycles; repair of personal and household goods
53			Compass Group plc	H Hotels and restaurants	55 Hotels and restaurants
54			InterContinental Hotels Group plc	H Hotels and restaurants	55 Hotels and restaurants
55			Enterprise Inns plc	H Hotels and restaurants	55 Hotels and restaurants
56	37[c]	38[c]	Carnival plc	I Transport, storage and communications	61 Water transport
57	38	39	British Airways plc	I Transport, storage and communications	62 Air transport
58	39	40	Vodafone Group plc	I Transport, storage and communications	64 Post and telecommunications

Full Sample	Restricted Sample	Additional Restricted Sample[a]	Sample Firms	17-Code ISIC Rev.3.1	Two-Digit ISIC Rev.3.1
59	40[c]	41[c]	BT Group plc	I Transport, storage and communications	64 Post and telecommunications
60			Cable & Wireless plc	I Transport, storage and communications	64 Post and telecommunications
61	41	42	HSBC Holdings plc	J Financial intermediation	65 Financial intermediation, except insurance and pension funding
62		43	The Royal Bank of Scotland Group plc	J Financial intermediation	65 Financial intermediation, except insurance and pension funding
63		44	Barclays plc	J Financial intermediation	65 Financial intermediation, except insurance and pension funding
64		45	HBOS plc	J Financial intermediation	65 Financial intermediation, except insurance and pension funding
65		46	Lloyds TSB Group plc	J Financial intermediation	65 Financial intermediation, except insurance and pension funding
66		47	Standard Chartered plc	J Financial intermediation	65 Financial intermediation, except insurance and pension funding
67		48[c]	Man Group plc	J Financial intermediation	65 Financial intermediation, except insurance and pension funding
68		49	Alliance & Leicester plc	J Financial intermediation	65 Financial intermediation, except insurance and pension funding
69		50	Northern Rock plc	J Financial intermediation	65 Financial intermediation, except insurance and pension funding
70			AMVESCAP plc	J Financial intermediation	65 Financial intermediation, except insurance and pension funding
71			3i Group plc	J Financial intermediation	65 Financial intermediation, except insurance and pension funding
72	42	51	Aviva plc	J Financial intermediation	66 Insurance and pension funding, except compulsory social security
73		52	Prudential plc	J Financial intermediation	66 Insurance and pension funding, except compulsory social security
74			Legal & General Group plc	J Financial intermediation	66 Insurance and pension funding, except compulsory social security
75	43[c]	53[c]	Old Mutual plc	J Financial intermediation	66 Insurance and pension funding, except compulsory social security
76	44	54	Friends Provident plc	J Financial intermediation	66 Insurance and pension funding, except compulsory social security
77	45	55	Royal & Sun Alliance Insurance Group plc	J Financial intermediation	66 Insurance and pension funding, except compulsory social security
78	46	56	Land Securities Group plc	K Real estate, renting and business activities	70 Real estate activities
79	47	57	The British Land Company plc	K Real estate, renting and business activities	70 Real estate activities
80	48[c]	58[c]	Liberty International plc	K Real estate, renting and business activities	70 Real estate activities
81	49	59	Hammerson plc	K Real estate, renting and business activities	70 Real estate activities
82			The Sage Group plc	K Real estate, renting and business activities	72 Computer and related activities
83	50[c]	60[c]	WPP Group plc	K Real estate, renting and business activities	74 Other business activities

Full Sample	Restricted Sample	Additional Restricted Sample[a]	Sample Firms	17-Code ISIC Rev.3.1	Two-Digit ISIC Rev.3.1
84	51	61	Yell Group plc	K Real estate, renting and business activities	74 Other business activities
85			The Capita Group plc	K Real estate, renting and business activities	74 Other business activities
86	52[c]		British Sky Broadcasting Group plc	O Other community, social and personal service activities	92 Recreational, cultural and sporting activities
87			Reuters Group plc	O Other community, social and personal service activities	92 Recreational, cultural and sporting activities
88	53[c]	62[c]	ITV plc	O Other community, social and personal service activities	92 Recreational, cultural and sporting activities
United States					
89	54	63	Exxon Mobil Corporation	C Mining and quarrying	11 Extraction of crude petroleum and natural gas; service activities incidental to oil and gas extraction, excluding surveying
90	55	64	Chevron Corporation	C Mining and quarrying	11 Extraction of crude petroleum and natural gas; service activities incidental to oil and gas extraction, excluding surveying
91			Schlumberger Limited	C Mining and quarrying	11 Extraction of crude petroleum and natural gas; service activities incidental to oil and gas extraction, excluding surveying
92	56	65	Occidental Petroleum Corporation	C Mining and quarrying	11 Extraction of crude petroleum and natural gas; service activities incidental to oil and gas extraction, excluding surveying
93	57	66	Halliburton Company	C Mining and quarrying	11 Extraction of crude petroleum and natural gas; service activities incidental to oil and gas extraction, excluding surveying
94			Devon Energy Corporation	C Mining and quarrying	11 Extraction of crude petroleum and natural gas; service activities incidental to oil and gas extraction, excluding surveying
95			PepsiCo, Inc.	D Manufacturing	15 Manufacture of food products and beverages
96	58	67	The Coca-Cola Company	D Manufacturing	15 Manufacture of food products and beverages
97		68	Anheuser-Busch Companies, Inc.	D Manufacturing	15 Manufacture of food products and beverages
98			Altria Group, Inc.	D Manufacturing	16 Manufacture of tobacco products
99	59	69	Kimberly-Clark Corporation	D Manufacturing	21 Manufacture of paper and paper products
100	60[c]	70[c]	News Corporation	D Manufacturing	22 Publishing, printing and reproduction of recorded media
101	61[c]	71[c]	ConocoPhillips	D Manufacturing	23 Manufacture of coke, refined petroleum products and nuclear fuel
102			Valero Energy Corporation	D Manufacturing	23 Manufacture of coke, refined petroleum products and nuclear fuel
103	62[b]	72	The Procter & Gamble Company	D Manufacturing	24 Manufacture of chemicals and chemical products

Full Sample	Restricted Sample	Additional Restricted Sample[a]	Sample Firms	17-Code ISIC Rev.3.1	Two-Digit ISIC Rev.3.1
104	63	73	Johnson & Johnson	D Manufacturing	24 Manufacture of chemicals and chemical products
105	64	74	Pfizer Inc.	D Manufacturing	24 Manufacture of chemicals and chemical products
106	65	75	Merck & Co., Inc.	D Manufacturing	24 Manufacture of chemicals and chemical products
107			Amgen Inc.	D Manufacturing	24 Manufacture of chemicals and chemical products
108	66	76	Abbott Laboratories	D Manufacturing	24 Manufacture of chemicals and chemical products
109	67[b]	77[b]	Wyeth	D Manufacturing	24 Manufacture of chemicals and chemical products
110	68	78	Bristol-Myers Squibb Company	D Manufacturing	24 Manufacture of chemicals and chemical products
111	69	79	Eli Lilly and Company	D Manufacturing	24 Manufacture of chemicals and chemical products
112	70	80	E.I. du Pont de Nemours and Company	D Manufacturing	24 Manufacture of chemicals and chemical products
113	71	81	The Dow Chemical Company	D Manufacturing	24 Manufacture of chemicals and chemical products
114	72	82	Schering-Plough Corporation	D Manufacturing	24 Manufacture of chemicals and chemical products
115			Colgate-Palmolive Company	D Manufacturing	24 Manufacture of chemicals and chemical products
116	73[b]	83[b]	3M Company	D Manufacturing	26 Manufacture of other non-metallic mineral products
117	74	84	Corning Incorporated	D Manufacturing	27 Manufacture of basic metals
118	75	85	United Technologies Corporation	D Manufacturing	29 Manufacture of machinery and equipment n.e.c.
119	76	86	Caterpillar Inc.	D Manufacturing	29 Manufacture of machinery and equipment n.e.c.
120	77	87	Hewlett-Packard Company	D Manufacturing	30 Manufacture of office, accounting and computing machinery
121			Apple Computer, Inc.	D Manufacturing	30 Manufacture of office, accounting and computing machinery
122	78	88	Dell Inc.	D Manufacturing	30 Manufacture of office, accounting and computing machinery
123	79[c]	89[c]	EMC Corporation	D Manufacturing	30 Manufacture of office, accounting and computing machinery
124	80	90	Cisco Systems, Inc.	D Manufacturing	32 Manufacture of radio, television and communication equipment and apparatus
125	81	91	Intel Corporation	D Manufacturing	32 Manufacture of radio, television and communication equipment and apparatus
126			QUALCOMM Incorporated	D Manufacturing	32 Manufacture of radio, television and communication equipment and apparatus
127	82	92	Motorola, Inc.	D Manufacturing	32 Manufacture of radio, television and communication equipment and apparatus

Full Sample	Restricted Sample	Additional Restricted Sample[a]	Sample Firms	17-Code ISIC Rev.3.1	Two-Digit ISIC Rev.3.1
128	83	93	Texas Instruments Incorporated	D Manufacturing	32 Manufacture of radio, television and communication equipment and apparatus
129			Medtronic, Inc.	D Manufacturing	33 Manufacture of medical, precision and optical instruments, watches and clocks
130	84	94	Emerson Electric Co.	D Manufacturing	33 Manufacture of medical, precision and optical instruments, watches and clocks
131	85	95	General Electric Company	D Manufacturing	35 Manufacture of other transport equipment
132			The Boeing Company	D Manufacturing	35 Manufacture of other transport equipment
133			Honeywell International Inc.	D Manufacturing	35 Manufacture of other transport equipment
134		96	Exelon Corporation	E Electricity, gas and water supply	40 Electricity, gas, steam and hot water supply
135			Dominion Resources, Inc.	E Electricity, gas and water supply	40 Electricity, gas, steam and hot water supply
136		97	Wal-Mart Stores, Inc.	G Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods	52 Retail trade, except of motor vehicles and motorcycles; repair of personal and household goods
137			The Home Depot, Inc.	G Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods	52 Retail trade, except of motor vehicles and motorcycles; repair of personal and household goods
138		98	Target Corporation	G Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods	52 Retail trade, except of motor vehicles and motorcycles; repair of personal and household goods
139			Lowe's Companies, Inc.	G Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods	52 Retail trade, except of motor vehicles and motorcycles; repair of personal and household goods
140			Walgreen Co.	G Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods	52 Retail trade, except of motor vehicles and motorcycles; repair of personal and household goods
141			eBay Inc.	G Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods	52 Retail trade, except of motor vehicles and motorcycles; repair of personal and household goods
142			McDonald's Corporation	H Hotels and restaurants	55 Hotels and restaurants
143		99[c]	AT&T Inc.	I Transport, storage and communications	64 Post and telecommunications
144	86	100	Verizon Communications Inc.	I Transport, storage and communications	64 Post and telecommunications
145[b]			BellSouth Corporation	I Transport, storage and communications	64 Post and telecommunications
146	87	101	United Parcel Service, Inc.	I Transport, storage and communications	64 Post and telecommunications
147			Tyco International Ltd.	I Transport, storage and communications	64 Post and telecommunications
148			Sprint Nextel Corporation	I Transport, storage and communications	64 Post and telecommunications
149			FedEx Corporation	I Transport, storage and communications	64 Post and telecommunications
150	88	102	Citigroup Inc.	J Financial intermediation	65 Financial intermediation, except insurance and pension funding

Full Sample	Restricted Sample	Additional Restricted Sample[a]	Sample Firms	17-Code ISIC Rev.3.1	Two-Digit ISIC Rev.3.1
151		103[c]	Bank of America Corporation	J Financial intermediation	65 Financial intermediation, except insurance and pension funding
152			JPMorgan Chase & Co.	J Financial intermediation	65 Financial intermediation, except insurance and pension funding
153		104	Wells Fargo & Company	J Financial intermediation	65 Financial intermediation, except insurance and pension funding
154			Wachovia Corporation	J Financial intermediation	65 Financial intermediation, except insurance and pension funding
155		105[b]	Morgan Stanley	J Financial intermediation	65 Financial intermediation, except insurance and pension funding
156			the Goldman Sachs Group, Inc.	J Financial intermediation	65 Financial intermediation, except insurance and pension funding
157			Merrill Lynch & Co., Inc.	J Financial intermediation	65 Financial intermediation, except insurance and pension funding
158			American Express Company	J Financial intermediation	65 Financial intermediation, except insurance and pension funding
159			U.S. Bancorp	J Financial intermediation	65 Financial intermediation, except insurance and pension funding
160			Fannie Mae	J Financial intermediation	65 Financial intermediation, except insurance and pension funding
161			The Federal Home Loan Mortgage Corporation (Freddie Mac)	J Financial intermediation	65 Financial intermediation, except insurance and pension funding
162			MetLife, Inc.	J Financial intermediation	65 Financial intermediation, except insurance and pension funding
163		106[c]	Washington Mutual, Inc.	J Financial intermediation	65 Financial intermediation, except insurance and pension funding
164			Lehman Brothers Holdings Inc.	J Financial intermediation	65 Financial intermediation, except insurance and pension funding
165			Prudential Financial, Inc.	J Financial intermediation	65 Financial intermediation, except insurance and pension funding
166			Capital One Financial Corporation	J Financial intermediation	65 Financial intermediation, except insurance and pension funding
167			SunTrust Banks, Inc.	J Financial intermediation	65 Financial intermediation, except insurance and pension funding
168			American International Group, Inc.	J Financial intermediation	66 Insurance and pension funding, except compulsory social security
169			UnitedHealth Group Incorporated	J Financial intermediation	66 Insurance and pension funding, except compulsory social security
170			WellPoint, Inc.	J Financial intermediation	66 Insurance and pension funding, except compulsory social security
171			The Allstate Corporation	J Financial intermediation	66 Insurance and pension funding, except compulsory social security
172		107[c]	The St. Paul Travelers Companies, Inc./The Travelers Companies, Inc.	J Financial intermediation	66 Insurance and pension funding, except compulsory social security
173			The Hartford Financial Services Group, Inc.	J Financial intermediation	66 Insurance and pension funding, except compulsory social security
174	89	108	Microsoft Corporation	K Real estate, renting and business activities	72 Computer and related activities
175			Oracle Corporation	K Real estate, renting and business activities	72 Computer and related activities

Full Sample	Restricted Sample	Additional Restricted Sample[a]	Sample Firms	17-Code ISIC Rev.3.1	Two-Digit ISIC Rev.3.1
176	90	109	International Business Machines Corporation	K Real estate, renting and business activities	74 Other business activities
177			Yahoo! Inc.	K Real estate, renting and business activities	74 Other business activities
178			Comcast Corporation	O Other community, social and personal service activities	92 Recreational, cultural and sporting activities
179			Time Warner Inc.	O Other community, social and personal service activities	92 Recreational, cultural and sporting activities
180	91[c]	110[c]	The Walt Disney Company	O Other community, social and personal service activities	92 Recreational, cultural and sporting activities
181			Viacom Inc.	O Other community, social and personal service activities	92 Recreational, cultural and sporting activities

(a) This additional restricted sample is for the third empirical study.

(b) Only the 2005 report(s) was/were included.

(c) Only the 2006 report(s) was/were included.

Appendix 2: System of Scoring – Relevance for Each of the Industry Sectors

$RELE_i$	Relevance Indicators	Score by Two-Digit ISIC Rev.3.1[(a)]												
		10	11	13	15	16	21	22	23	24	26	27	28	29 30
$RELE_1$	**MATERIALS/RESOURCE** *Reporting at least one of all major materials/resource used/extraction by the company:* For example: Natural gas: methane (CH_4), ethane (C_2H_6), propane (C_3H_8), butane (C_4H_{10}), pentane (C_5H_{12}) Oil Coal: lignite, hard coal Metals: iron, aluminium (bauxite), copper, lead, nickel, zinc, gold, silver	**11**	**11**	**11**	**11**	11	11	11	11	11	11	**11**	**11**	11
$RELE_{1.1}$	**Reporting on total or some of the materials/resource consumption/extraction:**	2	2	2	2	2	2	2	2	2	2	2	2	2
	In quantifiable terms (by weight: tonnes, kilograms or by volume: m^3, barrels of oil equivalent, litres)	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms (e.g. consider that it is a substantial part of business and/or associate this with environmental impact)	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on any of the materials/resource consumption/extraction	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{1.2}$	**Presenting an analysis of total or some of the materials/resource consumption/extraction by sector and by process:**	3	3	3	3	3	3	3	3	3	3	3	3	3
	Analysis of both	3	3	3	3	3	3	3	3	3	3	3	3	3
	Analysis by business sectors/divisions/functions (e.g. extraction and production/mining, refining, sales, corporate)	2	2	2	2	2	2	2	2	2	2	2	2	2
	Analysis by business processes/activities (e.g. operations, productions/manufacturing, delivery products/transport/distribution)	1	1	1	1	1	1	1	1	1	1	1	1	1
	No analysis	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{1.3}$	**Presenting an analysis of total or some of the materials/resource consumption/extraction per unit of output/energy intensity/energy efficiency:**	1	1	1	1	1	1	1	1	1	1	1	1	1
	Analysis per unit of output e.g. consumption/extraction per kWh of energy produced, consumption/extraction per tonne of production	1	1	1	1	1	1	1	1	1	1	1	1	1
	No analysis	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{1.4}$	**Reporting on the impacts arising from their materials/resource consumption/extraction:**	2	2	2	2	2	2	2	2	2	2	2	2	2
	In quantitative monetary terms (e.g. £, $, etc.)	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on the impacts arising from their materials/resource consumption/extraction	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{1.5}$	**Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives for more efficient use/extraction of**	1	1	1	1	1	1	1	1	1	1	1	1	1

$RELE_i$	Relevance Indicators	Score by Two-Digit ISIC Rev.3.1[(a)]												
		10	**11**	**13**	**15**	**16**	**21**	**22**	**23**	**24**	**26**	**27**	**28**	**29 30**
	the materials/resource (including initiatives to recycle/reuse the materials/resource):													
	Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives for more efficient use/extraction of the materials/resource	1	1	1	1	1	1	1	1	1	1	1	1	1
	No reporting	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{1.6}$	**Specification of quantitative targets/timelines for the measures to mitigate the impacts and/or on any initiatives for more efficient use/extraction of the materials/resource:**	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of short term quantitative targets/timelines (e.g. next year)	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of long term quantitative targets/timelines (e.g. more than a year hence)	1	1	1	1	1	1	1	1	1	1	1	1	1
	No specification of quantitative targets/timelines	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_2$	**ENERGY** *Reporting at least one of all energy used by the company:* Electricity Heat	**13**	13	**13**	**13**	13	13	13	13	13	13	**13**	**13**	13
$RELE_{2.1}$	**Reporting on total or some of direct energy use:**	2	2	2	2	2	2	2	2	2	2	2	2	2
	In quantifiable terms (kJ, GJ or kWh)	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms (e.g. consider that it is a substantial part of business and/or associate this with environmental impact)	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on direct energy use	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{2.2}$	**Presenting an analysis of total or some of direct energy use by sector and by process:**	3	3	3	3	3	3	3	3	3	3	3	3	3
	Analysis of both	3	3	3	3	3	3	3	3	3	3	3	3	3
	Analysis by business sectors/divisions/functions (e.g. extraction and production/mining, refining, sales, corporate)	2	2	2	2	2	2	2	2	2	2	2	2	2
	Analysis by business processes/activities (e.g. operations, productions/manufacturing, delivery products/transport/distribution)	1	1	1	1	1	1	1	1	1	1	1	1	1
	No analysis	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{2.3}$	**Presenting an analysis of total or some of direct energy use per unit of output/energy intensity/energy efficiency:**	1	1	1	1	1	1	1	1	1	1	1	1	1
	Analysis per unit of output e.g. use per kWh of energy produced, use per tonne of production	1	1	1	1	1	1	1	1	1	1	1	1	1
	No analysis	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{2.4}$	**Reporting on total or some of indirect energy use:** (e.g. include energy bought from distributors for supplying to customers, energy use in transportation)	2	2	2	2	2	2	2	2	2	2	2	2	2
	In quantifiable terms (kJ, GJ or kWh, MWh)	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms (e.g. consider that it is a substantial part of business and/or associate this with environmental impact)	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on indirect energy use	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{2.5}$	**Reporting on the impacts arising from their energy use:**	2	2	2	2	2	2	2	2	2	2	2	2	2

$RELE_i$	Relevance Indicators	Score by Two-Digit ISIC Rev.3.1[(a)]												
		10	11	13	15	16	21	22	23	24	26	27	28	29 30
	In quantitative monetary terms (e.g. £, $, etc.)	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on the impacts arising from their energy use	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{2.6}$	**Reporting on initiatives to use renewable energy sources and/or increase/improve energy efficiency:**	1	1	1	1	1	1	1	1	1	1	1	1	1
	Reporting on planned or implemented measures in production and supply of renewable energy (e.g. wind energy, solar power) and/or reporting on initiatives to increase/improve energy efficiency	1	1	1	1	1	1	1	1	1	1	1	1	1
	No reporting	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{2.7}$	**Specification of quantitative targets/timelines for the initiatives to use renewable energy sources and/or increase/improve energy efficiency:**	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of short term quantitative targets/timelines (e.g. next year)	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of long term quantitative targets/timelines (e.g. more than a year hence)	1	1	1	1	1	1	1	1	1	1	1	1	1
	No specification of quantitative targets/timelines	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_3$	**WATER** *Report on total water use*	**11**	**11**	**11**	**11**	**11**	**11**	**11**	**11**	**11**	**11**	**11**	**11**	**11**
$RELE_{3.1}$	**Reporting on total water use:**	2	2	2	2	2	2	2	2	2	2	2	2	2
	In quantifiable terms (m^3, litres)	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms (e.g. consider that it is a substantial part of business and/or associate this with environmental impact)	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on total water use	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{3.2}$	**Presenting an analysis of total water use by sector and by process:**	3	3	3	3	3	3	3	3	3	3	3	3	3
	Analysis of both	3	3	3	3	3	3	3	3	3	3	3	3	3
	Analysis by business sectors/divisions/functions (e.g. extraction and production/mining, refining, sales, corporate)	2	2	2	2	2	2	2	2	2	2	2	2	2
	Analysis by business processes/activities (e.g. operations, productions/manufacturing, delivery products/transport/distribution)	1	1	1	1	1	1	1	1	1	1	1	1	1
	No analysis	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{3.3}$	**Presenting an analysis of total water use per unit of output/energy intensity/energy efficiency:**	1	1	1	1	1	1	1	1	1	1	1	1	1
	Analysis per unit of output, e.g. use per kWh of energy produced, use per tonne of production	1	1	1	1	1	1	1	1	1	1	1	1	1
	No analysis	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{3.4}$	**Reporting on the impacts arising from their water use:**	2	2	2	2	2	2	2	2	2	2	2	2	2
	In quantitative monetary terms (e.g. £, $, etc.)	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on the impacts arising from their water use	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{3.5}$	**Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives for more efficient use of water (including initiatives to recycle/reuse water):**	1	1	1	1	1	1	1	1	1	1	1	1	1
	Reporting on planned or implemented measures to mitigate the impacts	1	1	1	1	1	1	1	1	1	1	1	1	1

$RELE_i$	Relevance Indicators	Score by Two-Digit ISIC Rev.3.1[(a)]												
		10	**11**	**13**	**15**	**16**	**21**	**22**	**23**	**24**	**26**	**27**	**28**	**29 30**
	and/or on any initiatives for more efficient use of water (including initiatives to recycle/reuse water)													
	No reporting	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{3.6}$	**Specification of quantitative targets/timelines for the measures to mitigate the impacts and/or of any initiatives for more efficient use of water:**	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of short term quantitative targets/timelines (e.g. next year)	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of long term quantitative targets/timelines (e.g. more than a year hence)	1	1	1	1	1	1	1	1	1	1	1	1	1
	No specification of quantitative targets/timelines	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_4$	**BIODIVERSITY** *Location, size and major impacts of land owned, leased, managed in, or adjacent to protected areas and areas of high biodiversity value outside protected areas, which are associated with the organisation's activities, products and/or services:*	**7**	7	**7**	**7**	7	7	7	7	7	7	**7**	**7**	7
$RELE_{4.1}$	**Reporting on area/location and type of value (biodiversity rich, ecologically significant habitat areas, protected and sensitive areas) of land owned, leased, managed in, or adjacent to protected areas and areas of high biodiversity value outside protected areas:**	2	2	2	2	2	2	2	2	2	2	2	2	2
	Reporting on area/location and type of value (biodiversity rich, ecologically significant habitat areas, protected and sensitive areas) of land owned, leased, managed in, or adjacent to protected areas and areas of high biodiversity value outside protected areas	2	2	2	2	2	2	2	2	2	2	2	2	2
	Reporting on a concern regarding biodiversity rich, ecologically significant habitat areas, protected and sensitive areas in general with no specifying the areas that are environmentally destroyed by company activities, products and/or services	1	1	1	1	1	1	1	1	1	1	1	1	1
	Reporting nothing on biodiversity rich, ecologically significant habitat areas, protected and sensitive areas	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{4.2}$	**Reporting on known or likely environmental impacts of activities, products and/or services on biodiversity in the protected areas and areas of high biodiversity value outside protected areas:**	2	2	2	2	2	2	2	2	2	2	2	2	2
	In quantitative monetary terms (e.g. £, $, etc.)	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on the impacts arising from their activities, products and/or services on biodiversity in the protected areas and areas of high biodiversity value outside protected areas	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{4.3}$	**Reporting on planned or implemented initiatives/policies/programmes to conserve, maintain or restore these areas to an acceptable standard:**	1	1	1	1	1	1	1	1	1	1	1	1	1
	Reporting on planned or implemented initiatives/policies/programmes to conserve, maintain or restore these areas to an acceptable standard	1	1	1	1	1	1	1	1	1	1	1	1	1
	No reporting	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{4.4}$	**Specification of quantitative targets/timelines for the planned or**	2	2	2	2	2	2	2	2	2	2	2	2	2

$RELE_i$	Relevance Indicators	Score by Two-Digit ISIC Rev.3.1[(a)]												
		10	11	13	15	16	21	22	23	24	26	27	28	29 30
	implemented initiatives/policies/programmes to conserve, maintain or restore these areas to an acceptable standard:													
	Specification of short term quantitative targets/timelines (e.g. next year)	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of long term quantitative targets/timelines (e.g. more than a year hence)	1	1	1	1	1	1	1	1	1	1	1	1	1
	No specification of quantitative targets/timelines	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_5$	**GREENHOUSE GASES (GHGs) EMISSIONS** *Reporting at least one of all direct, indirect and total greenhouse gases (GHGs) emissions:* GHGs: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFC_s), perfluorocarbons (PFC_s), sulphur hexafluoride (SF_6)	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**
$RELE_{5.1}$	**Direct GHGs emissions:**	***11***	***11***	***11***	***11***	***11***	***11***	***11***	***11***	***11***	***11***	***11***	***11***	***11***
$RELE_{5.1.1}$	**Reporting on total or some of direct GHGs emissions:**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**
	In quantifiable terms (tonnes CO_2 equivalent)	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms (e.g. consider that it is a substantial part of business and/or associate this with environmental impact)	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on direct GHGs emissions	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{5.1.2}$	**Presenting an analysis of total or some of direct GHGs emissions by sector and by process:**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
	Analysis of both	3	3	3	3	3	3	3	3	3	3	3	3	3
	Analysis by business sectors/divisions/functions (e.g. extraction and production/mining, refining, sales, corporate)	2	2	2	2	2	2	2	2	2	2	2	2	2
	Analysis by business processes/activities (e.g. operations, productions/manufacturing, delivery products/transport/distribution)	1	1	1	1	1	1	1	1	1	1	1	1	1
	No analysis	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{5.1.3}$	**Presenting an analysis of total or some of direct GHGs emissions per unit of output/energy intensity/energy efficiency:**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
	Analysis per unit of output e.g. consumption per kWh of energy produced, consumption per tonne of production	1	1	1	1	1	1	1	1	1	1	1	1	1
	No analysis	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{5.1.4}$	**Reporting on the impacts arising from their direct GHGs emissions:**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**
	In quantitative monetary terms (e.g. £, $, etc.)	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on the impacts arising from their direct GHGs emissions	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{5.1.5}$	**Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives to reduce the direct GHGs emissions (e.g. to reduce overall GHGs emissions, increase the energy efficiency, supply of renewable energy):**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
	Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives to reduce the direct GHGs emissions (e.g. to reduce overall GHGs emissions, increase the energy efficiency, supply of renewable energy)	1	1	1	1	1	1	1	1	1	1	1	1	1

$RELE_i$	Relevance Indicators	Score by Two-Digit ISIC Rev.3.1[(a)]												
		10	11	13	15	16	21	22	23	24	26	27	28	29 30
	No reporting	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{5.1.6}$	**Specification of quantitative targets/timelines for the measures to mitigate the impacts and/or of any initiatives to reduce the direct GHGs emissions (e.g. to reduce overall GHGs emissions, increase the energy efficiency, supply of renewable energy):**	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of short term quantitative targets/timelines (e.g. next year)	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of long term quantitative targets/timelines (e.g. more than a year hence)	1	1	1	1	1	1	1	1	1	1	1	1	1
	No specification of quantitative targets/timelines	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{5.2}$	**Indirect GHGs emissions:**	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*
$RELE_{5.2.1}$	**Reporting on total or some of indirect GHGs emissions:**	2	2	2	2	2	2	2	2	2	2	2	2	2
	In quantifiable terms (tonnes CO_2 equivalent)	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms (e.g. consider that it is a substantial part of business and/or associate this with environmental impact)	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on indirect GHGs emissions	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{5.2.2}$	**Presenting an analysis of total or some of indirect GHGs emissions by sector and by process:**	3	3	3	3	3	3	3	3	3	3	3	3	3
	Analysis of both	3	3	3	3	3	3	3	3	3	3	3	3	3
	Analysis by business sectors/divisions/functions (e.g. extraction and production/mining, refining, sales, corporate)	2	2	2	2	2	2	2	2	2	2	2	2	2
	Analysis by business processes/activities (e.g. operations, productions/manufacturing, delivery products/transport/distribution)	1	1	1	1	1	1	1	1	1	1	1	1	1
	No analysis	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{5.2.3}$	**Presenting an analysis of total or some of indirect GHGs emissions per unit of output/energy intensity/energy efficiency:**	1	1	1	1	1	1	1	1	1	1	1	1	1
	Analysis per unit of output e.g. consumption per kWh of energy produced, consumption per tonne of production	1	1	1	1	1	1	1	1	1	1	1	1	1
	No analysis	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{5.2.4}$	**Reporting on the impacts arising from their indirect GHGs emissions:**	2	2	2	2	2	2	2	2	2	2	2	2	2
	In quantitative monetary terms (e.g. £, $, etc.)	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on the impacts arising from their indirect GHGs emissions	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{5.2.5}$	**Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives to reduce the indirect GHGs emissions (e.g. to reduce overall GHGs emissions, increase the energy efficiency, supply of renewable energy):**	1	1	1	1	1	1	1	1	1	1	1	1	1
	Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives to reduce the indirect GHGs emissions (e.g. to reduce overall GHGs emissions, increase the energy efficiency, supply of renewable energy)	1	1	1	1	1	1	1	1	1	1	1	1	1
	No reporting	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{5.2.6}$	**Specification of quantitative targets/timelines for the measures to**	2	2	2	2	2	2	2	2	2	2	2	2	2

$RELE_i$	Relevance Indicators	Score by Two-Digit ISIC Rev.3.1[(a)]												
		10	11	13	15	16	21	22	23	24	26	27	28	29 30
	mitigate the impacts and/or of any initiatives to reduce the indirect GHGs emissions (e.g. to reduce overall GHGs emissions, increase the energy efficiency, supply of renewable energy):													
	Specification of short term quantitative targets/timelines (e.g. next year)	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of long term quantitative targets/timelines (e.g. more than a year hence)	1	1	1	1	1	1	1	1	1	1	1	1	1
	No specification of quantitative targets/timelines	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{5.3}$	**Combined/total GHGs emissions:**	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*
$RELE_{5.3.1}$	**Reporting on combined/total GHGs emissions:**	2	2	2	2	2	2	2	2	2	2	2	2	2
	In quantifiable terms (tonnes CO_2 equivalent)	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms (e.g. consider that it is a substantial part of business and/or associate this with environmental impact)	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on combined/total GHGs emissions	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{5.3.2}$	**Presenting an analysis of combined/total GHGs emissions by sector and by process:**	3	3	3	3	3	3	3	3	3	3	3	3	3
	Analysis of both	3	3	3	3	3	3	3	3	3	3	3	3	3
	Analysis by business sectors/divisions/functions (e.g. extraction and production/mining, refining, sales, corporate)	2	2	2	2	2	2	2	2	2	2	2	2	2
	Analysis by business processes/activities (e.g. operations, productions/manufacturing, delivery products/transport/distribution)	1	1	1	1	1	1	1	1	1	1	1	1	1
	No analysis	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{5.3.3}$	**Presenting an analysis of combined/total GHGs emissions per unit of output/energy intensity/energy efficiency:**	1	1	1	1	1	1	1	1	1	1	1	1	1
	Analysis per unit of output e.g. consumption per kWh of energy produced, consumption per tonne of production	1	1	1	1	1	1	1	1	1	1	1	1	1
	No analysis	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{5.3.4}$	**Reporting on the impacts arising from combined/total GHGs emissions:**	2	2	2	2	2	2	2	2	2	2	2	2	2
	In quantitative monetary terms (e.g. £, $, etc.)	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on the impacts arising from their combined/total GHGs emissions	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{5.3.5}$	**Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives to reduce the combined/total GHGs emissions (e.g. to reduce overall GHGs emissions, increase the energy efficiency, supply of renewable energy):**	1	1	1	1	1	1	1	1	1	1	1	1	1
	Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives to reduce the combined/total GHGs emissions (e.g. to reduce overall GHGs emissions, increase the energy efficiency, supply of renewable energy)	1	1	1	1	1	1	1	1	1	1	1	1	1
	No reporting	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{5.3.6}$	**Specification of quantitative targets/timelines for the measures to mitigate the impacts and/or of any initiatives to reduce the**	2	2	2	2	2	2	2	2	2	2	2	2	2

$RELE_i$	Relevance Indicators	Score by Two-Digit ISIC Rev.3.1[(a)]												
		10	11	13	15	16	21	22	23	24	26	27	28	29 30
	combined/total GHGs emissions (e.g. to reduce overall GHGs emissions, increase the energy efficiency, supply of renewable energy):													
	Specification of short term quantitative targets/timelines (e.g. next year)	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of long term quantitative targets/timelines (e.g. more than a year hence)	1	1	1	1	1	1	1	1	1	1	1	1	1
	No specification of quantitative targets/timelines	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_6$	**OZONE-DEPLETING SUBSTANCES (ODS) EMISSIONS** *Reporting at least one of Ozone-Depleting Substances (ODS) emissions:* ODS: chlorofluorocarbons (CFCs and Freons), hydrochlorofluorocarbons (HCFCs), halons, methyl chloroform, carbon tetrachloride, methyl bromide	**11**	11	**11**	**11**	11	11	11	11	**11**	11	**11**	**11**	11
$RELE_{6.1}$	**Reporting on total or some of ODS emissions:**	2	2	2	2	2	2	2	2	2	2	2	2	2
	In quantifiable terms (tonnes CFC-11 equivalent)	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms (e.g. consider that it is a substantial part of business and/or associate this with environmental impact)	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on ODS emissions	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{6.2}$	**Presenting an analysis of total or some of ODS emissions by sector and by process:**	3	3	3	3	3	3	3	3	3	3	3	3	3
	Analysis of both	3	3	3	3	3	3	3	3	3	3	3	3	3
	Analysis by business sectors/divisions/functions (e.g. extraction and production/mining, refining, sales, corporate)	2	2	2	2	2	2	2	2	2	2	2	2	2
	Analysis by business processes/activities (e.g. operations, productions/manufacturing, delivery products/transport/distribution)	1	1	1	1	1	1	1	1	1	1	1	1	1
	No analysis	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{6.3}$	**Presenting an analysis of total or some of ODS emissions per unit of output/energy intensity/energy efficiency:**	1	1	1	1	1	1	1	1	1	1	1	1	1
	Analysis per unit of output e.g. consumption per kWh of energy produced, consumption per tonne of production	1	1	1	1	1	1	1	1	1	1	1	1	1
	No analysis	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{6.4}$	**Reporting on the impacts arising from their ODS emissions:**	2	2	2	2	2	2	2	2	2	2	2	2	2
	In quantitative monetary terms (e.g. £, $, etc.)	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on the impacts arising from their ODS emissions	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{6.5}$	**Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives to reduce ODS emissions:**	1	1	1	1	1	1	1	1	1	1	1	1	1
	Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives to reduce ODS emissions	1	1	1	1	1	1	1	1	1	1	1	1	1
	No reporting	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{6.6}$	**Specification of quantitative targets/timelines for the measures to mitigate the impacts and/or of any initiatives to reduce ODS emissions:**	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of short term quantitative targets/timelines (e.g. next year)	2	2	2	2	2	2	2	2	2	2	2	2	2

$RELE_i$	Relevance Indicators	Score by Two-Digit ISIC Rev.3.1[(a)]												
		10	11	13	15	16	21	22	23	24	26	27	28	29 30
	Specification of long term quantitative targets/timelines (e.g. more than a year hence)	1	1	1	1	1	1	1	1	1	1	1	1	1
	No specification of quantitative targets/timelines	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_7$	**ACID RAIN AND SMOG PRECURSOR EMISSIONS** *Reporting at least one of acid rain and smog precursor emissions:* Acid rain and smog precursors: sulphur dioxide (SO_2), nitrous oxides (NO_x), ammonia (NH_3) and carbon monoxide (CO)	**11**	**11**	**11**	**11**	11	**11**	**11**	**11**	**11**	**11**	**11**	**11**	11
$RELE_{7.1}$	**Reporting on total or some of acid rain and smog precursor emissions:**	2	2	2	2	2	2	2	2	2	2	2	2	2
	In quantifiable terms (tonnes, kilograms)	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms (e.g. consider that it is a substantial part of business and/or associate this with environmental impact)	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on acid rain and smog precursor emissions	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{7.2}$	**Presenting an analysis of total or some of acid rain and smog precursor emissions by sector and by process:**	3	3	3	3	3	3	3	3	3	3	3	3	3
	Analysis of both	3	3	3	3	3	3	3	3	3	3	3	3	3
	Analysis by business sectors/divisions/functions (e.g. extraction and production/mining, refining, sales, corporate)	2	2	2	2	2	2	2	2	2	2	2	2	2
	Analysis by business processes/activities (e.g. operations, productions/manufacturing, delivery products/transport/distribution)	1	1	1	1	1	1	1	1	1	1	1	1	1
	No analysis	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{7.3}$	**Presenting an analysis of total or some of acid rain and smog precursor emissions per unit of output/energy intensity/energy efficiency:**	1	1	1	1	1	1	1	1	1	1	1	1	1
	Analysis per unit of output e.g. consumption per kWh of energy produced, consumption per tonne of production	1	1	1	1	1	1	1	1	1	1	1	1	1
	No analysis	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{7.4}$	**Reporting on the impacts arising from their acid rain and smog precursor emissions:**	2	2	2	2	2	2	2	2	2	2	2	2	2
	In quantitative monetary terms (e.g. £, $, etc.)	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on the impacts arising from their acid rain and smog precursor emissions	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{7.5}$	**Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives to reduce acid rain and smog precursor emissions:**	1	1	1	1	1	1	1	1	1	1	1	1	1
	Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives to reduce the acid rain and smog precursor emissions	1	1	1	1	1	1	1	1	1	1	1	1	1
	No reporting	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{7.6}$	**Specification of quantitative targets/timelines for the measures to mitigate the impacts and/or of any initiatives to reduce acid rain and smog precursor emissions:**	2	2	2	2	2	2	2	2	2	2	2	2	2

$RELE_i$	Relevance Indicators	Score by Two-Digit ISIC Rev.3.1[(a)]												
		10	11	13	15	16	21	22	23	24	26	27	28	29 30
	Specification of short term quantitative targets/timelines (e.g. next year)	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of long term quantitative targets/timelines (e.g. more than a year hence)	1	1	1	1	1	1	1	1	1	1	1	1	1
	No specification of quantitative targets/timelines	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_8$	**OTHER SIGNIFICANT EMISSIONS TO AIR AND LAND** *Reporting at least one of all metal emissions to air, volatile organic compounds (VOCs), metal emissions to land and pesticides and fertilisers:* Metal emissions to air: lead (Pb), mercury (Hg), cadmium (Cd), arsenic (As) and nickel (Ni) Volatile organic compounds (VOCs): trichloroethylene (TCE), tetrachloroethylene (dry cleaning fluid), trichloroethane, benzene, toluene, xylene Metal emissions to land: lead (Pb), mercury (Hg), cadmium (Cd), arsenic (As), copper (Cu), zinc (Zn) Pesticides and fertilisers: Pesticides: The term pesticide encompasses individual product types i.e. herbicides (including plant growth regulators), fungicides, microbiocides, rodenticides and various other substances used to control pests Fertilisers: The primary nutrients in fertilisers are nitrogen, phosphorus and potassium. Secondary nutrients include sulphur, magnesium and calcium.	**11**	44	**33**	44	44	**22**	**22**	**22**	**33**	**22**	**22**	44	**11**
$RELE_{8.1}$	**Metal emissions to air:** **lead (Pb), mercury (Hg), cadmium (Cd), arsenic (As) and nickel (Ni)**	*11*	*11*	***11***	*11*	*11*	*11*	*11*	***11***	***11***	***11***	***11***	*11*	*11*
$RELE_{8.1.1}$	**Reporting on total or some of metal emissions to air:**	2	2	2	2	2	2	2	2	2	2	2	2	2
	In quantifiable terms (tonnes, kilograms)	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms (e.g. consider that it is a substantial part of business and/or associate this with environmental impact)	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on metal emissions to air	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{8.1.2}$	**Presenting an analysis of total or some of metal emissions to air by sector and by process:**	3	3	3	3	3	3	3	3	3	3	3	3	3
	Analysis of both	3	3	3	3	3	3	3	3	3	3	3	3	3
	Analysis by business sectors/divisions/functions (e.g. extraction and production/mining, refining, sales, corporate)	2	2	2	2	2	2	2	2	2	2	2	2	2
	Analysis by business processes/activities (e.g. operations, productions/manufacturing, delivery products/transport/distribution)	1	1	1	1	1	1	1	1	1	1	1	1	1
	No analysis	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{8.1.3}$	**Presenting an analysis of total or some of metal emissions to air per unit of output/energy intensity/energy efficiency:**	1	1	1	1	1	1	1	1	1	1	1	1	1
	Analysis per unit of output e.g. consumption per kWh of energy produced, consumption per tonne of production	1	1	1	1	1	1	1	1	1	1	1	1	1
	No analysis	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{8.1.4}$	**Reporting on the impacts arising from their metal emissions to air:**	2	2	2	2	2	2	2	2	2	2	2	2	2
	In quantitative monetary terms (e.g. £, $, etc.)	2	2	2	2	2	2	2	2	2	2	2	2	2

$RELE_i$	Relevance Indicators	Score by Two-Digit ISIC Rev.3.1[(a)]												
		10	11	13	15	16	21	22	23	24	26	27	28	29 30
	In qualitative terms	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on the impacts arising from their metal emissions to air	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{8.1.5}$	**Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives to reduce the metal emissions to air:**	1	1	1	1	1	1	1	1	1	1	1	1	1
	Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives to reduce the metal emissions to air	1	1	1	1	1	1	1	1	1	1	1	1	1
	No reporting	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{8.1.6}$	**Specification of quantitative targets/timelines for the measures to mitigate the impacts and/or of any initiatives to reduce the metal emissions to air:**	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of short term quantitative targets/timelines (e.g. next year)	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of long term quantitative targets/timelines (e.g. more than a year hence)	1	1	1	1	1	1	1	1	1	1	1	1	1
	No specification of quantitative targets/timelines	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{8.2}$	**Volatile organic compound (VOC) emissions: trichloroethylene (TCE), tetrachloroethylene (dry cleaning fluid), trichloroethane, benzene, toluene, xylene**	*11*	*11*	*11*	*11*	*11*	***11***	***11***	*11*	***11***	*11*	*11*	*11*	*11*
$RELE_{8.2.1}$	**Reporting on total or some of VOC emissions:**	2	2	2	2	2	2	2	2	2	2	2	2	2
	In quantifiable terms (tonnes, kilograms)	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms (e.g. consider that it is a substantial part of business and/or associate this with environmental impact)	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on VOC emissions	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{8.2.2}$	**Presenting an analysis of total or some of VOC emissions by sector and by process:**	3	3	3	3	3	3	3	3	3	3	3	3	3
	Analysis of both	3	3	3	3	3	3	3	3	3	3	3	3	3
	Analysis by business sectors/divisions/functions (e.g. extraction and production/mining, refining, sales, corporate)	2	2	2	2	2	2	2	2	2	2	2	2	2
	Analysis by business processes/activities (e.g. operations, productions/manufacturing, delivery products/transport/distribution)	1	1	1	1	1	1	1	1	1	1	1	1	1
	No analysis	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{8.2.3}$	**Presenting an analysis of total or some of VOC emissions per unit of output/energy intensity/energy efficiency:**	1	1	1	1	1	1	1	1	1	1	1	1	1
	Analysis per unit of output e.g. consumption per kWh of energy produced, consumption per tonne of production	1	1	1	1	1	1	1	1	1	1	1	1	1
	No analysis	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{8.2.4}$	**Reporting on the impacts arising from their VOC emissions:**	2	2	2	2	2	2	2	2	2	2	2	2	2
	In quantitative monetary terms (e.g. £, $, etc.)	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on the impacts arising from their VOC emissions	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{8.2.5}$	**Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives to reduce VOC emissions:**	1	1	1	1	1	1	1	1	1	1	1	1	1
	Reporting on planned or implemented measures to mitigate the impacts	1	1	1	1	1	1	1	1	1	1	1	1	1

$RELE_i$	Relevance Indicators	Score by Two-Digit ISIC Rev.3.1[(a)]												
		10	11	13	15	16	21	22	23	24	26	27	28	29 30
	and/or on any initiatives to reduce the VOC emissions													
	No reporting	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{8.2.6}$	**Specification of quantitative targets/timelines for the measures to mitigate the impacts and/or of any initiatives to reduce VOC emissions:**	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of short term quantitative targets/timelines (e.g. next year)	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of long term quantitative targets/timelines (e.g. more than a year hence)	1	1	1	1	1	1	1	1	1	1	1	1	1
	No specification of quantitative targets/timelines	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{8.3}$	**Metal emissions to land: lead (Pb), mercury (Hg), cadmium (Cd), arsenic (As), copper (Cu), zinc (Zn)**	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*
$RELE_{8.3.1}$	**Reporting on total or some of metal emissions to land:**	2	2	2	2	2	2	2	2	2	2	2	2	2
	In quantifiable terms (tonnes, kilograms)	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms (e.g. consider that it is a substantial part of business and/or associate this with environmental impact)	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on metal emissions to land	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{8.3.2}$	**Presenting an analysis of total or some of metal emissions to land by sector and by process:**	3	3	3	3	3	3	3	3	3	3	3	3	3
	Analysis of both	3	3	3	3	3	3	3	3	3	3	3	3	3
	Analysis by business sectors/divisions/functions (e.g. extraction and production/mining, refining, sales, corporate)	2	2	2	2	2	2	2	2	2	2	2	2	2
	Analysis by business processes/activities (e.g. operations, productions/manufacturing, delivery products/transport/distribution)	1	1	1	1	1	1	1	1	1	1	1	1	1
	No analysis	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{8.3.3}$	**Presenting an analysis of total or some of metal emissions to land per unit of output/energy intensity/energy efficiency:**	1	1	1	1	1	1	1	1	1	1	1	1	1
	Analysis per unit of output e.g. consumption per kWh of energy produced, consumption per tonne of production	1	1	1	1	1	1	1	1	1	1	1	1	1
	No analysis	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{8.3.4}$	**Reporting on the impacts arising from their metal emissions to land:**	2	2	2	2	2	2	2	2	2	2	2	2	2
	In quantitative monetary terms (e.g. £, $, etc.)	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on the impacts arising from their metal emissions to land	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{8.3.5}$	**Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives to reduce the metal emissions to land:**	1	1	1	1	1	1	1	1	1	1	1	1	1
	Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives to reduce the metal emissions to land	1	1	1	1	1	1	1	1	1	1	1	1	1
	No reporting	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{8.3.6}$	**Specification of quantitative targets/timelines for the measures to mitigate the impacts and/or of any initiatives to reduce the metal**	2	2	2	2	2	2	2	2	2	2	2	2	2

$RELE_i$	Relevance Indicators	Score by Two-Digit ISIC Rev.3.1[(a)]												
		10	11	13	15	16	21	22	23	24	26	27	28	29 30
	emissions to land:													
	Specification of short term quantitative targets/timelines (e.g. next year)	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of long term quantitative targets/timelines (e.g. more than a year hence)	1	1	1	1	1	1	1	1	1	1	1	1	1
	No specification of quantitative targets/timelines	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{8.4}$	**Pesticide and fertiliser emissions:** **<u>Pesticides</u>: The term pesticide encompasses individual product types i.e. herbicides (including plant growth regulators), fungicides, microbiocides, rodenticides and various other substances used to control pests** **<u>Fertilisers</u>: the primary nutrients in fertilisers are nitrogen, phosphorus and potassium. Secondary nutrients include sulphur, magnesium and calcium.**	*11*	*11*	***11***	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*
$RELE_{8.4.1}$	**Reporting on total or some of pesticide and fertiliser emissions:**	2	2	2	2	2	2	2	2	2	2	2	2	2
	In quantifiable terms (tonnes, kilograms)	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms (e.g. consider that it is a substantial part of business and/or associate this with environmental impact)	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on pesticide and fertiliser emissions	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{8.4.2}$	**Presenting an analysis of total or some of pesticide and fertiliser emissions by sector and by process:**	3	3	3	3	3	3	3	3	3	3	3	3	3
	Analysis of both	3	3	3	3	3	3	3	3	3	3	3	3	3
	Analysis by business sectors/divisions/functions (e.g. extraction and production/mining, refining, sales, corporate)	2	2	2	2	2	2	2	2	2	2	2	2	2
	Analysis by business processes/activities (e.g. operations, productions/manufacturing, delivery products/transport/distribution)	1	1	1	1	1	1	1	1	1	1	1	1	1
	No analysis	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{8.4.3}$	**Presenting an analysis of total or some of pesticide and fertiliser emissions per unit of output/energy intensity/energy efficiency:**	1	1	1	1	1	1	1	1	1	1	1	1	1
	Analysis per unit of output e.g. consumption per kWh of energy produced, consumption per tonne of production	1	1	1	1	1	1	1	1	1	1	1	1	1
	No analysis	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{8.4.4}$	**Reporting on the impacts arising from their pesticide and fertiliser emissions:**	2	2	2	2	2	2	2	2	2	2	2	2	2
	In quantitative monetary terms (e.g. £, $, etc.)	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on the impacts arising from their pesticide and fertiliser emissions	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{8.4.5}$	**Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives to reduce the pesticide and fertiliser emissions:**	1	1	1	1	1	1	1	1	1	1	1	1	1
	Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives to reduce the pesticide and fertiliser emissions	1	1	1	1	1	1	1	1	1	1	1	1	1
	No reporting	0	0	0	0	0	0	0	0	0	0	0	0	0

$RELE_i$	Relevance Indicators	Score by Two-Digit ISIC Rev.3.1[(a)]												
		10	11	13	15	16	21	22	23	24	26	27	28	29 30
$RELE_{8.4.6}$	**Specification of quantitative targets/timelines for the measures to mitigate the impacts and/or of any initiatives to reduce the pesticide and fertiliser emissions:**	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of short term quantitative targets/timelines (e.g. next year)	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of long term quantitative targets/timelines (e.g. more than a year hence)	1	1	1	1	1	1	1	1	1	1	1	1	1
	No specification of quantitative targets/timelines	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_9$	**SIGNIFICANT DISCHARGES TO WATER** *Reporting on major/significant discharges to water:* Major discharges to water e.g. nutrients and organic pollutants: Nutrients and organic pollutants include contaminants, such as: polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), hexachlorocyclohexanes (HCH), benzene, toluene, Xylene, ethylbenzene, dioxins, phenols Metal emissions to water; arsenic (As), cadmium (Cd), chromium (Cr), copper (Cu), mercury (Hg), nickel (Ni), lead (Pb), zinc (Zn)	**7**	14	**14**	**7**	14	**14**	14	14	**7**	14	**7**	**7**	14
$RELE_{9.1}$	**Major discharges to water e.g. nutrients and organic pollutants, other contaminants**	*7*	*7*	*7*	*7*	*7*	*7*	*7*	*7*	*7*	*7*	*7*	*7*	*7*
$RELE_{9.1.1}$	**Reporting on total or some of major discharges to water and/or the quality of discharged water (i.e. suspended solid, heavy metals, other contaminants):**	2	2	2	2	2	2	2	2	2	2	2	2	2
	In quantifiable terms (tonnes, kilograms, m^3, total organic carbon (TOC), chemical oxygen demand (COD), biochemical oxygen demand (BOD), total suspended solids (TSS or SS), aquatic oxygen demand (AOD))	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms (e.g. consider that it is a substantial part of business and/or associate this with environmental impact)	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on major discharges to water	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{9.1.2}$	**Reporting on the impacts arising from their discharges to water:**	2	2	2	2	2	2	2	2	2	2	2	2	2
	In quantitative monetary terms (e.g. £, $, etc.)	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on the impacts arising from their discharges to water	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{9.1.3}$	**Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives to reduce the discharges to water:**	1	1	1	1	1	1	1	1	1	1	1	1	1
	Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives to reduce the discharges to water	1	1	1	1	1	1	1	1	1	1	1	1	1
	No reporting	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{9.1.4}$	**Specification of quantitative targets/timelines for the measures to mitigate the impacts and/or of any initiatives to reduce the discharges to water:**	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of short term quantitative targets/timelines (e.g. next year)	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of long term quantitative targets/timelines (e.g. more than a year hence)	1	1	1	1	1	1	1	1	1	1	1	1	1
	No specification of quantitative targets/timelines	0	0	0	0	0	0	0	0	0	0	0	0	0

$RELE_i$	Relevance Indicators	Score by Two-Digit ISIC Rev.3.1[(a)]												
		10	11	13	15	16	21	22	23	24	26	27	28	29 30
$RELE_{9.2}$	**Metal emissions to water: arsenic (As), cadmium (Cd), chromium (Cr), copper (Cu), mercury (Hg), nickel (Ni), lead (Pb), zinc (Zn)**	*7*	*7*	*7*	*7*	*7*	*7*	*7*	*7*	*7*	*7*	*7*	*7*	*7*
$RELE_{9.2.1}$	**Reporting on total or some of metal emissions to water:**	2	2	2	2	2	2	2	2	2	2	2	2	2
	In quantifiable terms (tonnes, kilograms)	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms (e.g. consider that it is a substantial part of business and/or associate this with environmental impact)	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on metal emissions to water	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{9.2.2}$	**Reporting on the impacts arising from their metal emissions to water:**	2	2	2	2	2	2	2	2	2	2	2	2	2
	In quantitative monetary terms (e.g. £, $, etc.)	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on the impacts arising from their metal emissions to water	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{9.2.3}$	**Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives to reduce the metal emissions to water:**	1	1	1	1	1	1	1	1	1	1	1	1	1
	Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives to reduce the metal emissions to water	1	1	1	1	1	1	1	1	1	1	1	1	1
	No reporting	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{9.2.4}$	**Specification of quantitative targets/timelines for the measures to mitigate the impacts and/or of any initiatives to reduce the metal emissions to water:**	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of short term quantitative targets/timelines (e.g. next year)	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of long term quantitative targets/timelines (e.g. more than a year hence)	1	1	1	1	1	1	1	1	1	1	1	1	1
	No specification of quantitative targets/timelines	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{10}$	**WASTE** *Reporting on waste by type and waste management method/route:* Hazardous waste: non municipal Non-hazardous waste: municipal (e.g. household) waste and office waste (e.g. paper, cardboard, plastic and metal packaging and organic materials)	**7**	**7**	**7**	**7**	**7**	**7**	**7**	**14**	**7**	**7**	**7**	**7**	**7**
$RELE_{10.1}$	**Hazardous (apart from radioactive) and non-hazardous waste**	*7*	*7*	*7*	*7*	*7*	*7*	*7*	*7*	*7*	*7*	*7*	*7*	*7*
$RELE_{10.1.1}$	**Reporting on total or some of waste produced by type and waste management method/route:**	2	2	2	2	2	2	2	2	2	2	2	2	2
	In quantifiable terms (tonnes, kilograms, litres)	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms (e.g. consider that it is a substantial part of business and/or associate this with environmental impact)	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on waste produced	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{10.1.2}$	**Reporting on the impacts arising from their waste produced:**	2	2	2	2	2	2	2	2	2	2	2	2	2
	In quantitative monetary terms (e.g. £, $, etc.)	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on the impacts arising from their waste produced	0	0	0	0	0	0	0	0	0	0	0	0	0

$RELE_i$	Relevance Indicators	Score by Two-Digit ISIC Rev.3.1[(a)]												
		10	11	13	15	16	21	22	23	24	26	27	28	29 30
$RELE_{10.1.3}$	**Reporting on any planned or implemented measures/initiatives to minimise/reduce the waste produced and/or to reuse/recycle waste:**	1	1	1	1	1	1	1	1	1	1	1	1	1
	Reporting on any planned or implemented measures/initiatives to minimise/reduce the waste produced and/or to reuse/recycle of waste	1	1	1	1	1	1	1	1	1	1	1	1	1
	No reporting	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{10.1.4}$	**Specification of quantitative targets/timelines for the measures/initiatives to minimise/reduce the waste produced and/or to reuse/recycle waste:**	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of short term quantitative targets/timelines (e.g. next year)	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of long term quantitative targets/timelines (e.g. more than a year hence)	1	1	1	1	1	1	1	1	1	1	1	1	1
	No specification of quantitative targets/timelines	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{10.2}$	**Hazardous waste: radioactive waste**	7	7	7	7	7	7	7	7	7	7	7	7	7
$RELE_{10.2.1}$	**Reporting on total radioactive waste produced:**	2	2	2	2	2	2	2	2	2	2	2	2	2
	In quantifiable terms (tonnes, kilograms of low, intermediate, or high level waste)	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms (e.g. consider that it is a substantial part of business and/or associate this with environmental impact)	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on total radioactive waste produced	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{10.2.2}$	**Reporting on the impacts arising from their radioactive waste produced:**	2	2	2	2	2	2	2	2	2	2	2	2	2
	In quantitative monetary terms (e.g. £, $, etc.)	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on the impacts arising from their radioactive waste produced	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{10.2.3}$	**Reporting on any planned or implemented measures/initiatives to minimise/reduce the radioactive waste produced:**	1	1	1	1	1	1	1	1	1	1	1	1	1
	Reporting on any planned or implemented measures/initiatives to minimise/reduce the radioactive waste produced	1	1	1	1	1	1	1	1	1	1	1	1	1
	No reporting	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{10.2.4}$	**Specification of quantitative targets/timelines for the measures/initiatives to minimise/reduce the radioactive waste produced:**	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of short term quantitative targets/timelines (e.g. next year)	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of long term quantitative targets/timelines (e.g. more than a year hence)	1	1	1	1	1	1	1	1	1	1	1	1	1
	No specification of quantitative targets/timelines	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{11}$	**SIGNIFICANT SPILLS** *Reporting on major/significant spills of at least one of the following caused from the organisation's activities:* Chemicals Oils Fuels	7	7	7	7	7	7	7	7	7	7	7	7	7

$RELE_i$	Relevance Indicators	Score by Two-Digit ISIC Rev.3.1[(a)]												
		10	11	13	15	16	21	22	23	24	26	27	28	29 30
	Tailings, slimes or other significant process materials													
$RELE_{11.1}$	**Reporting on total or some of major spills:**	2	2	2	2	2	2	2	2	2	2	2	2	2
	In quantifiable terms (tonnes, kilograms, m^3, litres, barrels of oil equivalent, etc.)	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms (e.g. consider that it is a substantial part of business and/or associate this with environmental impact)	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on total or some of major spills	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{11.2}$	**Reporting on the impacts arising from their spills:**	2	2	2	2	2	2	2	2	2	2	2	2	2
	In quantitative monetary terms (e.g. £, $, etc.)	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on the impacts arising from their spills	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{11.3}$	**Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives to reduce spills:**	1	1	1	1	1	1	1	1	1	1	1	1	1
	Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives to reduce spills	1	1	1	1	1	1	1	1	1	1	1	1	1
	No reporting	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{11.4}$	**Specification of quantitative targets/timelines for the measures to mitigate the impacts and/or of any initiatives to reduce spills:**	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of short term quantitative targets/timelines (e.g. next year)	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of long term quantitative targets/timelines (e.g. more than a year hence)	1	1	1	1	1	1	1	1	1	1	1	1	1
	No specification of quantitative targets/timelines	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{12}$	**SUPPLIERS**	2	2	2	2	2	2	2	2	2	2	2	2	2
	Initiatives for suppliers to adopt the same environmental standards:													
$RELE_{12.1}$	**Reporting on planned or implemented initiatives/policies/programmes aimed at encouraging suppliers to apply the same environmental standards:**	1	1	1	1	1	1	1	1	1	1	1	1	1
	Reporting on planned or implemented initiatives/policies/programmes aimed at encouraging suppliers to apply the same environmental standards	1	1	1	1	1	1	1	1	1	1	1	1	1
	No reporting	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{12.2}$	**Reporting on information of priorities, level of implementation and/or on monitoring and enforcement practices in the planned or implemented initiatives/policies/programmes, so as to encourage suppliers to apply same environmental standards:**	1	1	1	1	1	1	1	1	1	1	1	1	1
	Reporting on information of priorities, level of implementation and/or on monitoring and enforcement practices in the planned or implemented initiatives/policies/programmes, so as to encourage suppliers to apply same environmental standards	1	1	1	1	1	1	1	1	1	1	1	1	1
	No reporting	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{13}$	**PRODUCTS AND SERVICES**	6	6	6	6	6	6	6	6	6	6	6	6	6
$RELE_{13.1}$	**Reporting on major environmental impacts of company**	2	2	2	2	2	2	2	2	2	2	2	2	2

$RELE_i$	Relevance Indicators	Score by Two-Digit ISIC Rev.3.1[(a)]												
		10	**11**	**13**	**15**	**16**	**21**	**22**	**23**	**24**	**26**	**27**	**28**	**29 30**
	principal/major/key products and/or services:													
	In quantitative monetary terms (e.g. £, $, etc.)	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on the impacts of company products and/or services	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{13.2}$	**Reporting on planned or implemented measures/initiatives/policies/programmes to mitigate the impact (i.e. initiatives to improve product design and lessen impacts associated with manufacturing, use/consumption and disposal, such as initiatives: to reduce GHGs intensity of energy products, related to an eco-labelling scheme[(a)], aimed at increasing awareness of customers about environmental issues of principal/major/key products and/or services and/or initiatives to promote responsible consumption):**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
	Reporting on planned or implemented measures/initiatives/policies/programmes to mitigate the impact (i.e. initiatives to improve product design and lessen impacts associated with manufacturing, use/consumption and disposal, such as initiatives: to reduce GHGs intensity of energy products, related to an eco-labelling scheme[(a)], aimed at increasing awareness of customers about environmental issues of principal/major/key products and/or services and/or initiatives to promote responsible consumption)	1	1	1	1	1	1	1	1	1	1	1	1	1
	No reporting	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{13.3}$	**Specification of quantitative targets/timelines for the measures/initiatives/policies/programmes to mitigate the impact (i.e. initiatives to improve product design and lessen impacts associated with manufacturing, use/consumption and disposal, such as initiatives: to reduce GHGs intensity of energy products, related to an eco-labelling scheme[(a)], aimed at increasing awareness of customers about environmental issues of principal/major/key products and/or services and/or initiatives to promote them responsible consumption):**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**
	Specification of short term quantitative targets/timelines (e.g. next year)	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of long term quantitative targets/timelines (e.g. more than a year hence)	1	1	1	1	1	1	1	1	1	1	1	1	1
	No specification of quantitative targets/timelines	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{13.4}$	**Reporting on percentage of products sold/packaging materials that are recyclable/reusable:**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
	Reporting on percentage of products sold/packaging materials that are recyclable/reusable	1	1	1	1	1	1	1	1	1	1	1	1	1
	No reporting	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{14}$	**COMPLIANCE**	**5**	5	**5**	**5**	5	5	5	5	5	5	**5**	**5**	5
$RELE_{14.1}$	**Reporting on non-compliance with environmental laws and regulations incidents (e.g. having fines and/or penalties) or on compliance with relevant environmental laws and regulations, by stating that the company has no fines and/or penalties:**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**
	In quantitative monetary terms (e.g. £, $, etc.) or stating that the company has no fines and/or penalties	2	2	2	2	2	2	2	2	2	2	2	2	2

$RELE_i$	Relevance Indicators	Score by Two-Digit ISIC Rev.3.1[(a)]												
		10	11	13	15	16	21	22	23	24	26	27	28	29 30
	In qualitative terms	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on non-compliance with environmental laws and regulations incidents (fines and/or penalties) or on compliance with relevant environmental laws and regulations, by stating that the company has no fines and/or penalties	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{14.2}$	**Reporting on any remedial actions planned to improve/prevent the incidents:**	1	1	1	1	1	1	1	1	1	1	1	1	1
	Reporting on any remedial actions planned to improve/prevent the incidents	1	1	1	1	1	1	1	1	1	1	1	1	1
	No reporting	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{14.3}$	**Specification of quantitative targets/timelines for the remedial actions planned to improve/prevent the incidents:**	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of short term quantitative targets/timelines (e.g. next year)	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of long term quantitative targets/timelines (e.g. more than a year hence)	1	1	1	1	1	1	1	1	1	1	1	1	1
	No specification of quantitative targets/timelines	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{15}$	**TRANSPORTATION**	5	5	5	**5**	5	5	5	5	5	5	5	5	5
$RELE_{15.1}$	**Reporting on environmental impacts of transportation used for logistical purposes and/or used for members of the workforce transferring/transporting purposes:**	2	2	2	2	2	2	2	2	2	2	2	2	2
	In quantitative monetary terms (e.g. £, $, etc.)	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on the environmental impacts of transportation used for logistical purposes and/or used for members of the workforce transferring/transporting purposes	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{15.2}$	**Reporting on any efforts to reduce the impacts of transportation used for logistical purposes and/or used for members of the workforce transferring/transporting purposes:**	1	1	1	1	1	1	1	1	1	1	1	1	1
	Reporting on any efforts to reduce the impacts of transportation used for logistical purposes and/or used for members of the workforce transferring/transporting purposes	1	1	1	1	1	1	1	1	1	1	1	1	1
	No reporting	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{15.3}$	**Specification of quantitative targets/timelines for the efforts to reduce the impacts of transportation used for logistical purposes and/or used for members of the workforce transferring/transporting purposes:**	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of short term quantitative targets/timelines (e.g. next year)	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of long term quantitative targets/timelines (e.g. more than a year hence)	1	1	1	1	1	1	1	1	1	1	1	1	1
	No specification of quantitative targets/timelines	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{16}$	**RISKS AND LIABILITIES** *Reporting on:* Risks and liabilities arising from the organisation's activities Risks to business itself: climate risk, risks from weather conditions,	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**10**

$RELE_i$	Relevance Indicators	Score by Two-Digit ISIC Rev.3.1[(a)]												
		10	11	13	15	16	21	22	23	24	26	27	28	29 30
	natural disaster/catastrophe likelihood, etc.													
$RELE_{16.1}$	**Risks and liabilities arising from the organisation's activities:**	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*
$RELE_{16.1.1}$	**Reporting on environmental risks and liabilities arising from business activities:**	2	2	2	2	2	2	2	2	2	2	2	2	2
	In quantitative monetary terms (e.g. £, $, etc.)	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on the environmental risks and liabilities arising from business activities	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{16.1.2}$	**Reporting on any initiatives to cope with/mitigate such risks/liabilities (e.g. engaging with financial instruments/insurance to cover environmental risks/liabilities, indicating any work towards reducing the risks/liabilities):**	1	1	1	1	1	1	1	1	1	1	1	1	1
	Reporting on any initiatives to cope with/mitigate such risks/liabilities (e.g. engaging with financial instruments/insurance to cover environmental risks/liabilities, indicating any work towards reducing the risks/liabilities)	1	1	1	1	1	1	1	1	1	1	1	1	1
	No reporting	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{16.1.3}$	**Specification of quantitative targets/timelines for the initiatives to cope with/mitigate such risks/liabilities:**	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of short term quantitative targets/timelines (e.g. next year)	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of long term quantitative targets/timelines (e.g. more than a year hence)	1	1	1	1	1	1	1	1	1	1	1	1	1
	No specification of quantitative targets/timelines	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{16.2}$	**Risks to business itself (e.g. climate risk, risks from weather conditions, natural disaster/catastrophe likelihood, etc.):**	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*
$RELE_{16.2.1}$	**Reporting on policies/programmes/designated management levels for consideration of such risks and reporting on such risks, segmented by type of risks:**	2	2	2	2	2	2	2	2	2	2	2	2	2
	In quantitative monetary terms (e.g. £, $, etc.) (regarded as commercial risks)	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on the policies/programmes/designated management levels for consideration of such risks and reporting on such risks, segmented by type of risks	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{16.2.2}$	**Reporting on any initiatives to cope with/mitigate such risks (e.g. engaging with financial instruments/insurance to cover environmental risks):**	1	1	1	1	1	1	1	1	1	1	1	1	1
	Reporting on any initiatives to cope with/mitigate such risks (e.g. engaging with financial instruments/insurance to cover environmental risks)	1	1	1	1	1	1	1	1	1	1	1	1	1
	No reporting	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{16.2.3}$	**Specification of quantitative targets/timelines for the initiatives to**	2	2	2	2	2	2	2	2	2	2	2	2	2

$RELE_i$	Relevance Indicators	Score by Two-Digit ISIC Rev.3.1[(a)]												
		10	**11**	**13**	**15**	**16**	**21**	**22**	**23**	**24**	**26**	**27**	**28**	**29 30**
	cope with/mitigate such risks:													
	Specification of short term quantitative targets/timelines (e.g. next year)	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of long term quantitative targets/timelines (e.g. more than a year hence)	1	1	1	1	1	1	1	1	1	1	1	1	1
	No specification of quantitative targets/timelines	0	0	0	0	0	0	0	0	0	0	0	0	0
	MAXIMUM TOTAL SCORE	**150**	**83**	**179**	**144**	**61**	**108**	**94**	**101**	**123**	**94**	**161**	**139**	**72**

(a) Eco-labelling scheme, in this case, means any schemes relating to a labelling system for company products that can help avoid detrimental effects on the environment and/or enable customers to choose greener products or identify those that have come from a sustainable source (European Commission, 2007b).
(b) The penultimate column contains the maximum scores for the main items and the italicised scores are the sub total maxima within these, which are employed in the weighting process, as discussed in chapter 4.

$RELE_i$	Relevance Indicators	Score by Two-Digit ISIC Rev.3.1[(a)]													
		32	33	35	40	41	45	51 52 55 74	61 62	64	65	66	70	72	92
$RELE_1$	**MATERIALS/RESOURCE** *Report*ing *at least one of all major materials/resource used/extraction by the company:* For example: Natural gas: methane (CH_4), ethane (C_2H_6), propane (C_3H_8), butane (C_4H_{10}), pentane (C_5H_{12}) Oil Coal: lignite, hard coal Metals: iron, aluminium (bauxite), copper, lead, nickel, zinc, gold, silver	11	11	11	11	11	11	11	11	11	11	11	11	11	11
$RELE_{1.1}$	**Reporting on total or some of the materials/resource consumption/extraction:**	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	In quantifiable terms (by weight: tonnes, kilograms or by volume: m^3, barrels of oil equivalent, litres)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms (e.g. consider that it is a substantial part of business and/or associate this with environmental impact)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on any of the materials/resource consumption/extraction	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{1.2}$	**Presenting an analysis of total or some of the materials/resource consumption/extraction by sector and by process:**	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	Analysis of both	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	Analysis by business sectors/divisions/functions (e.g. extraction and production/mining, refining, sales, corporate)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Analysis by business processes/activities (e.g. operations, productions/manufacturing, delivery products/transport/distribution)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{1.3}$	**Presenting an analysis of total or some of the materials/resource consumption/extraction per unit of output/energy intensity/energy efficiency:**	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Analysis per unit of output e.g. consumption/extraction per kWh of energy produced, consumption/extraction per tonne of production	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{1.4}$	**Reporting on the impacts arising from their materials/resource consumption/extraction:**	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	In quantitative monetary terms (e.g. £, $, etc.)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on the impacts arising from their materials/resource consumption/extraction	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{1.5}$	**Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives for more efficient use/extraction of the materials/resource (including**	1	1	1	1	1	1	1	1	1	1	1	1	1	1

$RELE_i$	Relevance Indicators	Score by Two-Digit ISIC Rev.3.1[a]													
		32	33	35	40	41	45	51 52 55 74	61 62	64	65	66	70	72	92
	initiatives to recycle/reuse the materials/resource):														
	Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives for more efficient use/extraction of the materials/resource	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No reporting	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{1.6}$	**Specification of quantitative targets/timelines for the measures to mitigate the impacts and/or on any initiatives for more efficient use/extraction of the materials/resource:**	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of short term quantitative targets/timelines (e.g. next year)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of long term quantitative targets/timelines (e.g. more than a year hence)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No specification of quantitative targets/timelines	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_2$	**ENERGY** *Reporting at least one of all energy used by the company:* Electricity Heat	13	13	13	13	13	13	13	13	13	13	13	13	13	13
$RELE_{2.1}$	**Reporting on total or some of direct energy use:**	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	In quantifiable terms (kJ, GJ or kWh)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms (e.g. consider that it is a substantial part of business and/or associate this with environmental impact)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on direct energy use	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{2.2}$	**Presenting an analysis of total or some of direct energy use by sector and by process:**	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	Analysis of both	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	Analysis by business sectors/divisions/functions (e.g. extraction and production/mining, refining, sales, corporate)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Analysis by business processes/activities (e.g. operations, productions/manufacturing, delivery products/transport/distribution)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{2.3}$	**Presenting an analysis of total or some of direct energy use per unit of output/energy intensity/energy efficiency:**	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Analysis per unit of output e.g. use per kWh of energy produced, use per tonne of production	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{2.4}$	**Reporting on total or some of indirect energy use:** (e.g. include energy bought from distributors for supplying to customers, energy use in transportation)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	In quantifiable terms (kJ, GJ or kWh, MWh)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms (e.g. consider that it is a substantial part of business and/or associate this with environmental impact)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on indirect energy use	0	0	0	0	0	0	0	0	0	0	0	0	0	0

$RELE_i$	Relevance Indicators	Score by Two-Digit ISIC Rev.3.1[(a)]													
		32	33	35	40	41	45	51 52 55 74	61 62	64	65	66	70	72	92
$RELE_{2.5}$	**Reporting on the impacts arising from their energy use:**	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	In quantitative monetary terms (e.g. £, $, etc.)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on the impacts arising from their energy use	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{2.6}$	**Reporting on initiatives to use renewable energy sources and/or increase/improve energy efficiency:**	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Reporting on planned or implemented measures in production and supply of renewable energy (e.g. wind energy, solar power) and/or reporting on initiatives to increase/improve energy efficiency	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No reporting	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{2.7}$	**Specification of quantitative targets/timelines for the initiatives to use renewable energy sources and/or increase/improve energy efficiency:**	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of short term quantitative targets/timelines (e.g. next year)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of long term quantitative targets/timelines (e.g. more than a year hence)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No specification of quantitative targets/timelines	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_3$	**WATER** *Report on total water use*	**11**	**11**	**11**	**11**	**11**	**11**	11	**11**	11	**11**	**11**	**11**	11	11
$RELE_{3.1}$	**Reporting on total water use:**	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	In quantifiable terms (m^3, litres)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms (e.g. consider that it is a substantial part of business and/or associate this with environmental impact)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on total water use	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{3.2}$	**Presenting an analysis of total water use by sector and by process:**	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	Analysis of both	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	Analysis by business sectors/divisions/functions (e.g. extraction and production/mining, refining, sales, corporate)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Analysis by business processes/activities (e.g. operations, productions/manufacturing, delivery products/transport/distribution)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{3.3}$	**Presenting an analysis of total water use per unit of output/energy intensity/energy efficiency:**	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Analysis per unit of output, e.g. use per kWh of energy produced, use per tonne of production	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{3.4}$	**Reporting on the impacts arising from their water use:**	2	2	2	2	2	2	2	2	2	2	2	2	2	2

$RELE_i$	Relevance Indicators	Score by Two-Digit ISIC Rev.3.1[(a)]													
		32	**33**	**35**	**40**	**41**	**45**	**51 52 55 74**	**61 62**	**64**	**65**	**66**	**70**	**72**	**92**
	In quantitative monetary terms (e.g. £, $, etc.)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on the impacts arising from their water use	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{3.5}$	**Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives for more efficient use of water (including initiatives to recycle/reuse water):**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
	Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives for more efficient use of water (including initiatives to recycle/reuse water)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No reporting	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{3.6}$	**Specification of quantitative targets/timelines for the measures to mitigate the impacts and/or of any initiatives for more efficient use of water:**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**
	Specification of short term quantitative targets/timelines (e.g. next year)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of long term quantitative targets/timelines (e.g. more than a year hence)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No specification of quantitative targets/timelines	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_4$	**BIODIVERSITY** *Location, size and major impacts of land owned, leased, managed in, or adjacent to protected areas and areas of high biodiversity value outside protected areas, which are associated with the organisation's activities, products and/or services:*	**7**	**7**	**7**	**7**	**7**	**7**	**7**	**7**	**7**	**7**	**7**	**7**	**7**	**7**
$RELE_{4.1}$	**Reporting on area/location and type of value (biodiversity rich, ecologically significant habitat areas, protected and sensitive areas) of land owned, leased, managed in, or adjacent to protected areas and areas of high biodiversity value outside protected areas:**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**
	Reporting on area/location and type of value (biodiversity rich, ecologically significant habitat areas, protected and sensitive areas) of land owned, leased, managed in, or adjacent to protected areas and areas of high biodiversity value outside protected areas	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Reporting on a concern regarding biodiversity rich, ecologically significant habitat areas, protected and sensitive areas in general with no specifying the areas that are environmentally destroyed by company activities, products and/or services	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Reporting nothing on biodiversity rich, ecologically significant habitat areas, protected and sensitive areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{4.2}$	**Reporting on known or likely environmental impacts of activities, products and/or services on biodiversity in the protected areas and areas of high biodiversity value outside**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**

$RELE_i$	Relevance Indicators	Score by Two-Digit ISIC Rev.3.1[a]													
		32	33	35	40	41	45	51 52 55 74	61 62	64	65	66	70	72	92
	protected areas:														
	In quantitative monetary terms (e.g. £, $, etc.)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on the impacts arising from their activities, products and/or services on biodiversity in the protected areas and areas of high biodiversity value outside protected areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{4.3}$	**Reporting on planned or implemented initiatives/policies/programmes to conserve, maintain or restore these areas to an acceptable standard:**	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Reporting on planned or implemented initiatives/policies/programmes to conserve, maintain or restore these areas to an acceptable standard	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No reporting	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{4.4}$	**Specification of quantitative targets/timelines for the planned or implemented initiatives/policies/programmes to conserve, maintain or restore these areas to an acceptable standard:**	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of short term quantitative targets/timelines (e.g. next year)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of long term quantitative targets/timelines (e.g. more than a year hence)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No specification of quantitative targets/timelines	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_5$	**GREENHOUSE GASES (GHGs) EMISSIONS** *Reporting at least one of all direct, indirect and total greenhouse gases (GHGs) emissions:* GHGs: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFC_s), perfluorocarbons (PFC_s), sulphur hexafluoride (SF_6)	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**
$RELE_{5.1}$	**Direct GHGs emissions:**	***11***	***11***	***11***	***11***	***11***	***11***	***11***	***11***	***11***	***11***	***11***	***11***	***11***	***11***
$RELE_{5.1.1}$	**Reporting on total or some of direct GHGs emissions:**	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	In quantifiable terms (tonnes CO_2 equivalent)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms (e.g. consider that it is a substantial part of business and/or associate this with environmental impact)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on direct GHGs emissions	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{5.1.2}$	**Presenting an analysis of total or some of direct GHGs emissions by sector and by process:**	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	Analysis of both	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	Analysis by business sectors/divisions/functions (e.g. extraction and production/mining, refining, sales, corporate)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Analysis by business processes/activities (e.g. operations, productions/manufacturing, delivery products/transport/distribution)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0

$RELE_i$	Relevance Indicators	Score by Two-Digit ISIC Rev.3.1[(a)]													
		32	33	35	40	41	45	51 52 55 74	61 62	64	65	66	70	72	92
$RELE_{5.1.3}$	**Presenting an analysis of total or some of direct GHGs emissions per unit of output/energy intensity/energy efficiency:**	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Analysis per unit of output e.g. consumption per kWh of energy produced, consumption per tonne of production	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{5.1.4}$	**Reporting on the impacts arising from their direct GHGs emissions:**	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	In quantitative monetary terms (e.g. £, $, etc.)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on the impacts arising from their direct GHGs emissions	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{5.1.5}$	**Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives to reduce the direct GHGs emissions (e.g. to reduce overall GHGs emissions, increase the energy efficiency, supply of renewable energy):**	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives to reduce the direct GHGs emissions (e.g. to reduce overall GHGs emissions, increase the energy efficiency, supply of renewable energy)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No reporting	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{5.1.6}$	**Specification of quantitative targets/timelines for the measures to mitigate the impacts and/or of any initiatives to reduce the direct GHGs emissions (e.g. to reduce overall GHGs emissions, increase the energy efficiency, supply of renewable energy):**	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of short term quantitative targets/timelines (e.g. next year)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of long term quantitative targets/timelines (e.g. more than a year hence)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No specification of quantitative targets/timelines	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{5.2}$	**Indirect GHGs emissions:**	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*
$RELE_{5.2.1}$	**Reporting on total or some of indirect GHGs emissions:**	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	In quantifiable terms (tonnes CO_2 equivalent)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms (e.g. consider that it is a substantial part of business and/or associate this with environmental impact)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on indirect GHGs emissions	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{5.2.2}$	**Presenting an analysis of total or some of indirect GHGs emissions by sector and by process:**	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	Analysis of both	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	Analysis by business sectors/divisions/functions (e.g. extraction and production/mining, refining, sales, corporate)	2	2	2	2	2	2	2	2	2	2	2	2	2	2

$RELE_i$	Relevance Indicators	Score by Two-Digit ISIC Rev.3.1[(a)]													
		32	33	35	40	41	45	51 52 55 74	61 62	64	65	66	70	72	92
	Analysis by business processes/activities (e.g. operations, productions/manufacturing, delivery products/transport/distribution)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{5.2.3}$	**Presenting an analysis of total or some of indirect GHGs emissions per unit of output/energy intensity/energy efficiency:**	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Analysis per unit of output e.g. consumption per kWh of energy produced, consumption per tonne of production	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{5.2.4}$	**Reporting on the impacts arising from their indirect GHGs emissions:**	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	In quantitative monetary terms (e.g. £, $, etc.)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on the impacts arising from their indirect GHGs emissions	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{5.2.5}$	**Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives to reduce the indirect GHGs emissions (e.g. to reduce overall GHGs emissions, increase the energy efficiency, supply of renewable energy):**	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives to reduce the indirect GHGs emissions (e.g. to reduce overall GHGs emissions, increase the energy efficiency, supply of renewable energy)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No reporting	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{5.2.6}$	**Specification of quantitative targets/timelines for the measures to mitigate the impacts and/or of any initiatives to reduce the indirect GHGs emissions (e.g. to reduce overall GHGs emissions, increase the energy efficiency, supply of renewable energy):**	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of short term quantitative targets/timelines (e.g. next year)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of long term quantitative targets/timelines (e.g. more than a year hence)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No specification of quantitative targets/timelines	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{5.3}$	**Combined/total GHGs emissions:**	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*
$RELE_{5.3.1}$	**Reporting on combined/total GHGs emissions:**	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	In quantifiable terms (tonnes CO_2 equivalent)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms (e.g. consider that it is a substantial part of business and/or associate this with environmental impact)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on combined/total GHGs emissions	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{5.3.2}$	**Presenting an analysis of combined/total GHGs emissions**	3	3	3	3	3	3	3	3	3	3	3	3	3	3

$RELE_i$	Relevance Indicators	Score by Two-Digit ISIC Rev.3.1[a]													
		32	**33**	**35**	**40**	**41**	**45**	**51 52 55 74**	**61 62**	**64**	**65**	**66**	**70**	**72**	**92**
	by sector and by process:														
	Analysis of both	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	Analysis by business sectors/divisions/functions (e.g. extraction and production/mining, refining, sales, corporate)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Analysis by business processes/activities (e.g. operations, productions/manufacturing, delivery products/transport/distribution)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{5.3.3}$	**Presenting an analysis of combined/total GHGs emissions per unit of output/energy intensity/energy efficiency:**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
	Analysis per unit of output e.g. consumption per kWh of energy produced, consumption per tonne of production	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{5.3.4}$	**Reporting on the impacts arising from combined/total GHGs emissions:**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**
	In quantitative monetary terms (e.g. £, $, etc.)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on the impacts arising from their combined/total GHGs emissions	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{5.3.5}$	**Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives to reduce the combined/total GHGs emissions (e.g. to reduce overall GHGs emissions, increase the energy efficiency, supply of renewable energy):**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
	Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives to reduce the combined/total GHGs emissions (e.g. to reduce overall GHGs emissions, increase the energy efficiency, supply of renewable energy)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No reporting	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{5.3.6}$	**Specification of quantitative targets/timelines for the measures to mitigate the impacts and/or of any initiatives to reduce the combined/total GHGs emissions (e.g. to reduce overall GHGs emissions, increase the energy efficiency, supply of renewable energy):**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**
	Specification of short term quantitative targets/timelines (e.g. next year)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of long term quantitative targets/timelines (e.g. more than a year hence)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No specification of quantitative targets/timelines	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_6$	**OZONE-DEPLETING SUBSTANCES (ODS) EMISSIONS** *Reporting at least one of Ozone-Depleting Substances (ODS) emissions:* ODS: chlorofluorocarbons (CFCs and Freons), hydrochlorofluorocarbons (HCFCs), halons, methyl	**11**	**11**	**11**	**11**	**11**	**11**	**11**	**11**	**11**	**11**	**11**	**11**	**11**	**11**

$RELE_i$	Relevance Indicators	Score by Two-Digit ISIC Rev.3.1[a]													
		32	33	35	40	41	45	51 52 55 74	61 62	64	65	66	70	72	92
	chloroform, carbon tetrachloride, methyl bromide														
$RELE_{6.1}$	**Reporting on total or some of ODS emissions:**	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	In quantifiable terms (tonnes CFC-11 equivalent)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms (e.g. consider that it is a substantial part of business and/or associate this with environmental impact)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on ODS emissions	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{6.2}$	**Presenting an analysis of total or some of ODS emissions by sector and by process:**	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	Analysis of both	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	Analysis by business sectors/divisions/functions (e.g. extraction and production/mining, refining, sales, corporate)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Analysis by business processes/activities (e.g. operations, productions/manufacturing, delivery products/transport/distribution)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{6.3}$	**Presenting an analysis of total or some of ODS emissions per unit of output/energy intensity/energy efficiency:**	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Analysis per unit of output e.g. consumption per kWh of energy produced, consumption per tonne of production	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{6.4}$	**Reporting on the impacts arising from their ODS emissions:**	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	In quantitative monetary terms (e.g. £, $, etc.)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on the impacts arising from their ODS emissions	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{6.5}$	**Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives to reduce ODS emissions:**	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives to reduce ODS emissions	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No reporting	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{6.6}$	**Specification of quantitative targets/timelines for the measures to mitigate the impacts and/or of any initiatives to reduce ODS emissions:**	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of short term quantitative targets/timelines (e.g. next year)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of long term quantitative targets/timelines (e.g. more than a year hence)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No specification of quantitative targets/timelines	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_7$	**ACID RAIN AND SMOG PRECURSOR EMISSIONS**	11	11	11	11	11	11	11	11	11	11	11	11	11	11
	Reporting at least one of acid rain and smog precursor emissions:														
	Acid rain and smog precursors: sulphur dioxide (SO_2), nitrous														

$RELE_i$	Relevance Indicators	Score by Two-Digit ISIC Rev.3.1[a]													
		32	33	35	40	41	45	51 52 55 74	61 62	64	65	66	70	72	92
	oxides (NO_x), ammonia (NH_3) and carbon monoxide (CO)														
$RELE_{7.1}$	**Reporting on total or some of acid rain and smog precursor emissions:**	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	In quantifiable terms (tonnes, kilograms)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms (e.g. consider that it is a substantial part of business and/or associate this with environmental impact)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on acid rain and smog precursor emissions	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{7.2}$	**Presenting an analysis of total or some of acid rain and smog precursor emissions by sector and by process:**	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	Analysis of both	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	Analysis by business sectors/divisions/functions (e.g. extraction and production/mining, refining, sales, corporate)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Analysis by business processes/activities (e.g. operations, productions/manufacturing, delivery products/transport/distribution)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{7.3}$	**Presenting an analysis of total or some of acid rain and smog precursor emissions per unit of output/energy intensity/energy efficiency:**	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Analysis per unit of output e.g. consumption per kWh of energy produced, consumption per tonne of production	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{7.4}$	**Reporting on the impacts arising from their acid rain and smog precursor emissions:**	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	In quantitative monetary terms (e.g. £, $, etc.)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on the impacts arising from their acid rain and smog precursor emissions	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{7.5}$	**Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives to reduce acid rain and smog precursor emissions:**	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives to reduce the acid rain and smog precursor emissions	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No reporting	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{7.6}$	**Specification of quantitative targets/timelines for the measures to mitigate the impacts and/or of any initiatives to reduce acid rain and smog precursor emissions:**	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of short term quantitative targets/timelines (e.g. next year)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of long term quantitative targets/timelines (e.g. more than a year hence)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No specification of quantitative targets/timelines	0	0	0	0	0	0	0	0	0	0	0	0	0	0

$RELE_i$	Relevance Indicators	Score by Two-Digit ISIC Rev.3.1[(a)]													
		32	33	35	40	41	45	51 52 55 74	61 62	64	65	66	70	72	92
$RELE_8$	**OTHER SIGNIFICANT EMISSIONS TO AIR AND LAND** *Reporting at least one of all metal emissions to air, volatile organic compounds (VOCs), metal emissions to land and pesticides and fertilisers:* Metal emissions to air: lead (Pb), mercury (Hg), cadmium (Cd), arsenic (As) and nickel (Ni) Volatile organic compounds (VOCs): trichloroethylene (TCE), tetrachloroethylene (dry cleaning fluid), trichloroethane, benzene, toluene, xylene Metal emissions to land: lead (Pb), mercury (Hg), cadmium (Cd), arsenic (As), copper (Cu), zinc (Zn) Pesticides and fertilisers: Pesticides: The term pesticide encompasses individual product types i.e. herbicides (including plant growth regulators), fungicides, microbiocides, rodenticides and various other substances used to control pests Fertilisers: The primary nutrients in fertilisers are nitrogen, phosphorus and potassium. Secondary nutrients include sulphur, magnesium and calcium.	**11**	44	44	**22**	44	44	44	44	44	44	44	44	44	44
$RELE_{8.1}$	**Metal emissions to air: lead (Pb), mercury (Hg), cadmium (Cd), arsenic (As) and nickel (Ni)**	*11*	*11*	*11*	***11***	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*
$RELE_{8.1.1}$	**Reporting on total or some of metal emissions to air:**	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	In quantifiable terms (tonnes, kilograms)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms (e.g. consider that it is a substantial part of business and/or associate this with environmental impact)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on metal emissions to air	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{8.1.2}$	**Presenting an analysis of total or some of metal emissions to air by sector and by process:**	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	Analysis of both	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	Analysis by business sectors/divisions/functions (e.g. extraction and production/mining, refining, sales, corporate)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Analysis by business processes/activities (e.g. operations, productions/manufacturing, delivery products/transport/distribution)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{8.1.3}$	**Presenting an analysis of total or some of metal emissions to air per unit of output/energy intensity/energy efficiency:**	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Analysis per unit of output e.g. consumption per kWh of energy produced, consumption per tonne of production	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{8.1.4}$	**Reporting on the impacts arising from their metal emissions to air:**	2	2	2	2	2	2	2	2	2	2	2	2	2	2

$RELE_i$	Relevance Indicators	Score by Two-Digit ISIC Rev.3.1[a]													
		32	33	35	40	41	45	51 52 55 74	61 62	64	65	66	70	72	92
	In quantitative monetary terms (e.g. £, $, etc.)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on the impacts arising from their metal emissions to air	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{8.1.5}$	**Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives to reduce the metal emissions to air:**	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives to reduce the metal emissions to air	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No reporting	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{8.1.6}$	**Specification of quantitative targets/timelines for the measures to mitigate the impacts and/or of any initiatives to reduce the metal emissions to air:**	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of short term quantitative targets/timelines (e.g. next year)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of long term quantitative targets/timelines (e.g. more than a year hence)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No specification of quantitative targets/timelines	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{8.2}$	**Volatile organic compound (VOC) emissions: trichloroethylene (TCE), tetrachloroethylene (dry cleaning fluid), trichloroethane, benzene, toluene, xylene**	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*
$RELE_{8.2.1}$	**Reporting on total or some of VOC emissions:**	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	In quantifiable terms (tonnes, kilograms)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms (e.g. consider that it is a substantial part of business and/or associate this with environmental impact)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on VOC emissions	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{8.2.2}$	**Presenting an analysis of total or some of VOC emissions by sector and by process:**	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	Analysis of both	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	Analysis by business sectors/divisions/functions (e.g. extraction and production/mining, refining, sales, corporate)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Analysis by business processes/activities (e.g. operations, productions/manufacturing, delivery products/transport/distribution)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{8.2.3}$	**Presenting an analysis of total or some of VOC emissions per unit of output/energy intensity/energy efficiency:**	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Analysis per unit of output e.g. consumption per kWh of energy produced, consumption per tonne of production	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{8.2.4}$	**Reporting on the impacts arising from their VOC**	2	2	2	2	2	2	2	2	2	2	2	2	2	2

$RELE_i$	Relevance Indicators	Score by Two-Digit ISIC Rev.3.1[(a)]													
		32	33	35	40	41	45	51 52 55 74	61 62	64	65	66	70	72	92
	emissions:														
	In quantitative monetary terms (e.g. £, $, etc.)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on the impacts arising from their VOC emissions	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{8.2.5}$	**Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives to reduce VOC emissions:**	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives to reduce the VOC emissions	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No reporting	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{8.2.6}$	**Specification of quantitative targets/timelines for the measures to mitigate the impacts and/or of any initiatives to reduce VOC emissions:**	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of short term quantitative targets/timelines (e.g. next year)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of long term quantitative targets/timelines (e.g. more than a year hence)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No specification of quantitative targets/timelines	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{8.3}$	**Metal emissions to land: lead (Pb), mercury (Hg), cadmium (Cd), arsenic (As), copper (Cu), zinc (Zn)**	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*
$RELE_{8.3.1}$	**Reporting on total or some of metal emissions to land:**	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	In quantifiable terms (tonnes, kilograms)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms (e.g. consider that it is a substantial part of business and/or associate this with environmental impact)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on metal emissions to land	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{8.3.2}$	**Presenting an analysis of total or some of metal emissions to land by sector and by process:**	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	Analysis of both	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	Analysis by business sectors/divisions/functions (e.g. extraction and production/mining, refining, sales, corporate)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Analysis by business processes/activities (e.g. operations, productions/manufacturing, delivery products/transport/distribution)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{8.3.3}$	**Presenting an analysis of total or some of metal emissions to land per unit of output/energy intensity/energy efficiency:**	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Analysis per unit of output e.g. consumption per kWh of energy produced, consumption per tonne of production	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{8.3.4}$	**Reporting on the impacts arising from their metal emissions to land:**	2	2	2	2	2	2	2	2	2	2	2	2	2	2

$RELE_i$	Relevance Indicators	Score by Two-Digit ISIC Rev.3.1[a]													
		32	33	35	40	41	45	51 52 55 74	61 62	64	65	66	70	72	92
	In quantitative monetary terms (e.g. £, $, etc.)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on the impacts arising from their metal emissions to land	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{8.3.5}$	**Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives to reduce the metal emissions to land:**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
	Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives to reduce the metal emissions to land	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No reporting	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{8.3.6}$	**Specification of quantitative targets/timelines for the measures to mitigate the impacts and/or of any initiatives to reduce the metal emissions to land:**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**
	Specification of short term quantitative targets/timelines (e.g. next year)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of long term quantitative targets/timelines (e.g. more than a year hence)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No specification of quantitative targets/timelines	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{8.4}$	**Pesticide and fertiliser emissions:** **<u>Pesticides</u>: The term pesticide encompasses individual product types i.e. herbicides (including plant growth regulators), fungicides, microbiocides, rodenticides and various other substances used to control pests** **<u>Fertilisers</u>: the primary nutrients in fertilisers are nitrogen, phosphorus and potassium. Secondary nutrients include sulphur, magnesium and calcium.**	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*
$RELE_{8.4.1}$	**Reporting on total or some of pesticide and fertiliser emissions:**	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	In quantifiable terms (tonnes, kilograms)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms (e.g. consider that it is a substantial part of business and/or associate this with environmental impact)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on pesticide and fertiliser emissions	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{8.4.2}$	**Presenting an analysis of total or some of pesticide and fertiliser emissions by sector and by process:**	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	Analysis of both	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	Analysis by business sectors/divisions/functions (e.g. extraction and production/mining, refining, sales, corporate)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Analysis by business processes/activities (e.g. operations, productions/manufacturing, delivery products/transport/distribution)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{8.4.3}$	**Presenting an analysis of total or some of pesticide and**	1	1	1	1	1	1	1	1	1	1	1	1	1	1

$RELE_i$	Relevance Indicators	Score by Two-Digit ISIC Rev.3.1[(a)]													
		32	33	35	40	41	45	51 52 55 74	61 62	64	65	66	70	72	92
	fertiliser emissions per unit of output/energy intensity/energy efficiency:														
	Analysis per unit of output e.g. consumption per kWh of energy produced, consumption per tonne of production	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No analysis	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{8.4.4}$	**Reporting on the impacts arising from their pesticide and fertiliser emissions:**	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	In quantitative monetary terms (e.g. £, $, etc.)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on the impacts arising from their pesticide and fertiliser emissions	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{8.4.5}$	**Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives to reduce the pesticide and fertiliser emissions:**	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives to reduce the pesticide and fertiliser emissions	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No reporting	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{8.4.6}$	**Specification of quantitative targets/timelines for the measures to mitigate the impacts and/or of any initiatives to reduce the pesticide and fertiliser emissions:**	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of short term quantitative targets/timelines (e.g. next year)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of long term quantitative targets/timelines (e.g. more than a year hence)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No specification of quantitative targets/timelines	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_9$	**SIGNIFICANT DISCHARGES TO WATER** *Reporting on major/significant discharges to water:* Major discharges to water e.g. nutrients and organic pollutants: Nutrients and organic pollutants include contaminants, such as: polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), hexachlorocyclohexanes (HCH), benzene, toluene, Xylene, ethylbenzene, dioxins, phenols Metal emissions to water: arsenic (As), cadmium (Cd), chromium (Cr), copper (Cu), mercury (Hg), nickel (Ni), lead (Pb), zinc (Zn)	14	14	14	14	7	14	14	7	14	7	7	14	14	14
$RELE_{9.1}$	**Major discharges to water e.g. nutrients and organic pollutants, other contaminants**	7	7	7	7	7	7	7	7	7	7	7	7	7	7
$RELE_{9.1.1}$	**Reporting on total or some of major discharges to water and/or the quality of discharged water (i.e. suspended solid, heavy metals, other contaminants):**	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	In quantifiable terms (tonnes, kilograms, m^3, total organic carbon (TOC), chemical oxygen demand (COD), biochemical	2	2	2	2	2	2	2	2	2	2	2	2	2	2

$RELE_i$	Relevance Indicators	Score by Two-Digit ISIC Rev.3.1[a]													
		32	33	35	40	41	45	51 52 55 74	61 62	64	65	66	70	72	92
	oxygen demand (BOD), total suspended solids (TSS or SS), aquatic oxygen demand (AOD))														
	In qualitative terms (e.g. consider that it is a substantial part of business and/or associate this with environmental impact)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on major discharges to water	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{9.1.2}$	**Reporting on the impacts arising from their discharges to water:**	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	In quantitative monetary terms (e.g. £, $, etc.)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on the impacts arising from their discharges to water	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{9.1.3}$	**Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives to reduce the discharges to water:**	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives to reduce the discharges to water	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No reporting	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{9.1.4}$	**Specification of quantitative targets/timelines for the measures to mitigate the impacts and/or of any initiatives to reduce the discharges to water:**	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of short term quantitative targets/timelines (e.g. next year)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of long term quantitative targets/timelines (e.g. more than a year hence)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No specification of quantitative targets/timelines	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{9.2}$	**Metal emissions to water: arsenic (As), cadmium (Cd), chromium (Cr), copper (Cu), mercury (Hg), nickel (Ni), lead (Pb), zinc (Zn)**	*7*	*7*	*7*	*7*	*7*	*7*	*7*	*7*	*7*	*7*	*7*	*7*	*7*	*7*
$RELE_{9.2.1}$	**Reporting on total or some of metal emissions to water:**	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	In quantifiable terms (tonnes, kilograms)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms (e.g. consider that it is a substantial part of business and/or associate this with environmental impact)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on metal emissions to water	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{9.2.2}$	**Reporting on the impacts arising from their metal emissions to water:**	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	In quantitative monetary terms (e.g. £, $, etc.)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on the impacts arising from their metal emissions to water	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{9.2.3}$	**Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives to reduce the metal**	1	1	1	1	1	1	1	1	1	1	1	1	1	1

$RELE_i$	Relevance Indicators	Score by Two-Digit ISIC Rev.3.1[a]													
		32	33	35	40	41	45	51 52 55 74	61 62	64	65	66	70	72	92
	emissions to water:														
	Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives to reduce the metal emissions to water	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No reporting	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{9.2.4}$	**Specification of quantitative targets/timelines for the measures to mitigate the impacts and/or of any initiatives to reduce the metal emissions to water:**	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of short term quantitative targets/timelines (e.g. next year)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of long term quantitative targets/timelines (e.g. more than a year hence)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No specification of quantitative targets/timelines	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{10}$	**WASTE** *Reporting on waste by type and waste management method/route:* Hazardous waste: non municipal Non-hazardous waste: municipal (e.g. household) waste and office waste (e.g. paper, cardboard, plastic and metal packaging and organic materials)	**7**	**7**	**7**	**14**	14	**7**	**7**	**7**	**7**	**7**	**7**	**7**	14	**7**
$RELE_{10.1}$	**Hazardous (apart from radioactive) and non-hazardous waste**	*7*	*7*	*7*	*7*	*7*	*7*	*7*	*7*	*7*	*7*	*7*	*7*	*7*	*7*
$RELE_{10.1.1}$	**Reporting on total or some of waste produced by type and waste management method/route:**	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	In quantifiable terms (tonnes, kilograms, litres)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms (e.g. consider that it is a substantial part of business and/or associate this with environmental impact)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on waste produced	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{10.1.2}$	**Reporting on the impacts arising from their waste produced:**	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	In quantitative monetary terms (e.g. £, $, etc.)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on the impacts arising from their waste produced	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{10.1.3}$	**Reporting on any planned or implemented measures/initiatives to minimise/reduce the waste produced and/or to reuse/recycle waste:**	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Reporting on any planned or implemented measures/initiatives to minimise/reduce the waste produced and/or to reuse/recycle of waste	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No reporting	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{10.1.4}$	**Specification of quantitative targets/timelines for the measures/initiatives to minimise/reduce the waste produced**	2	2	2	2	2	2	2	2	2	2	2	2	2	2

$RELE_i$	Relevance Indicators	Score by Two-Digit ISIC Rev.3.1[(a)]													
		32	33	35	40	41	45	51 52 55 74	61 62	64	65	66	70	72	92
	and/or to reuse/recycle waste:														
	Specification of short term quantitative targets/timelines (e.g. next year)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of long term quantitative targets/timelines (e.g. more than a year hence)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No specification of quantitative targets/timelines	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{10.2}$	**Hazardous waste: radioactive waste**	*7*	*7*	*7*	***7***	*7*	*7*	*7*	*7*	*7*	*7*	*7*	*7*	*7*	*7*
$RELE_{10.2.1}$	**Reporting on total radioactive waste produced:**	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	In quantifiable terms (tonnes, kilograms of low, intermediate, or high level waste)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms (e.g. consider that it is a substantial part of business and/or associate this with environmental impact)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on total radioactive waste produced	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{10.2.2}$	**Reporting on the impacts arising from their radioactive waste produced:**	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	In quantitative monetary terms (e.g. £, $, etc.)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on the impacts arising from their radioactive waste produced	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{10.2.3}$	**Reporting on any planned or implemented measures/initiatives to minimise/reduce the radioactive waste produced:**	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Reporting on any planned or implemented measures/initiatives to minimise/reduce the radioactive waste produced	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No reporting	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{10.2.4}$	**Specification of quantitative targets/timelines for the measures/initiatives to minimise/reduce the radioactive waste produced:**	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of short term quantitative targets/timelines (e.g. next year)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of long term quantitative targets/timelines (e.g. more than a year hence)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No specification of quantitative targets/timelines	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{11}$	**SIGNIFICANT SPILLS** *Reporting on major/significant spills of at least one of the following caused from the organisation's activities:* Chemicals Oils Fuels Tailings, slimes or other significant process materials	*7*	*7*	*7*	**7**	*7*	*7*	*7*	**7**	*7*	**7**	**7**	*7*	*7*	*7*
$RELE_{11.1}$	**Reporting on total or some of major spills:**	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	In quantifiable terms (tonnes, kilograms, m^3, litres, barrels of	2	2	2	2	2	2	2	2	2	2	2	2	2	2

$RELE_i$	Relevance Indicators	Score by Two-Digit ISIC Rev.3.1[(a)]													
		32	33	35	40	41	45	51 52 55 74	61 62	64	65	66	70	72	92
	oil equivalent, etc.)														
	In qualitative terms (e.g. consider that it is a substantial part of business and/or associate this with environmental impact)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on total or some of major spills	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{11.2}$	**Reporting on the impacts arising from their spills:**	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	In quantitative monetary terms (e.g. £, $, etc.)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on the impacts arising from their spills	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{11.3}$	**Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives to reduce spills:**	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Reporting on planned or implemented measures to mitigate the impacts and/or on any initiatives to reduce spills	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No reporting	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{11.4}$	**Specification of quantitative targets/timelines for the measures to mitigate the impacts and/or of any initiatives to reduce spills:**	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of short term quantitative targets/timelines (e.g. next year)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of long term quantitative targets/timelines (e.g. more than a year hence)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No specification of quantitative targets/timelines	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{12}$	**SUPPLIERS** *Initiatives for suppliers to adopt the same environmental standards:*	2	2	2	2	2	2	2	2	2	2	2	2	2	2
$RELE_{12.1}$	**Reporting on planned or implemented initiatives/policies/programmes aimed at encouraging suppliers to apply the same environmental standards:**	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Reporting on planned or implemented initiatives/policies/programmes aimed at encouraging suppliers to apply the same environmental standards	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No reporting	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{12.2}$	**Reporting on information of priorities, level of implementation and/or on monitoring and enforcement practices in the planned or implemented initiatives/policies/programmes, so as to encourage suppliers to apply same environmental standards:**	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Reporting on information of priorities, level of implementation and/or on monitoring and enforcement practices in the planned or implemented initiatives/policies/programmes, so as to encourage suppliers to apply same environmental standards	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No reporting	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{13}$	**PRODUCTS AND SERVICES**	6	6	6	6	6	6	6	6	6	6	6	6	6	6

$RELE_i$	Relevance Indicators	Score by Two-Digit ISIC Rev.3.1[a]													
		32	33	35	40	41	45	51 52 55 74	61 62	64	65	66	70	72	92
$RELE_{13.1}$	**Reporting on major environmental impacts of company principal/major/key products and/or services:**	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	In quantitative monetary terms (e.g. £, $, etc.)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on the impacts of company products and/or services	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{13.2}$	**Reporting on planned or implemented measures/initiatives/policies/programmes to mitigate the impact (i.e. initiatives to improve product design and lessen impacts associated with manufacturing, use/consumption and disposal, such as initiatives: to reduce GHGs intensity of energy products, related to an eco-labelling scheme[a], aimed at increasing awareness of customers about environmental issues of principal/major/key products and/or services and/or initiatives to promote responsible consumption):**	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Reporting on planned or implemented measures/initiatives/policies/programmes to mitigate the impact (i.e. initiatives to improve product design and lessen impacts associated with manufacturing, use/consumption and disposal, such as initiatives: to reduce GHGs intensity of energy products, related to an eco-labelling scheme[a], aimed at increasing awareness of customers about environmental issues of principal/major/key products and/or services and/or initiatives to promote responsible consumption)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No reporting	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{13.3}$	**Specification of quantitative targets/timelines for the measures/initiatives/policies/programmes to mitigate the impact (i.e. initiatives to improve product design and lessen impacts associated with manufacturing, use/consumption and disposal, such as initiatives: to reduce GHGs intensity of energy products, related to an eco-labelling scheme[a], aimed at increasing awareness of customers about environmental issues of principal/major/key products and/or services and/or initiatives to promote them responsible consumption):**	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of short term quantitative targets/timelines (e.g. next year)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of long term quantitative targets/timelines (e.g. more than a year hence)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No specification of quantitative targets/timelines	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{13.4}$	**Reporting on percentage of products sold/packaging materials that are recyclable/reusable:**	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Reporting on percentage of products sold/packaging materials that are recyclable/reusable	1	1	1	1	1	1	1	1	1	1	1	1	1	1

$RELE_i$	Relevance Indicators	Score by Two-Digit ISIC Rev.3.1[a]													
		32	33	35	40	41	45	51 52 55 74	61 62	64	65	66	70	72	92
	No reporting	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{14}$	**COMPLIANCE**	5	5	5	5	5	5	5	5	5	5	5	5	5	5
$RELE_{14.1}$	**Reporting on non-compliance with environmental laws and regulations incidents (e.g. having fines and/or penalties) or on compliance with relevant environmental laws and regulations, by stating that the company has no fines and/or penalties:**	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	In quantitative monetary terms (e.g. £, $, etc.) or stating that the company has no fines and/or penalties	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on non-compliance with environmental laws and regulations incidents (fines and/or penalties) or on compliance with relevant environmental laws and regulations, by stating that the company has no fines and/or penalties	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{14.2}$	**Reporting on any remedial actions planned to improve/prevent the incidents:**	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Reporting on any remedial actions planned to improve/prevent the incidents	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No reporting	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{14.3}$	**Specification of quantitative targets/timelines for the remedial actions planned to improve/prevent the incidents:**	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of short term quantitative targets/timelines (e.g. next year)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of long term quantitative targets/timelines (e.g. more than a year hence)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No specification of quantitative targets/timelines	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{15}$	**TRANSPORTATION**	5	5	5	5	5	5	5	5	5	5	5	5	5	5
$RELE_{15.1}$	**Reporting on environmental impacts of transportation used for logistical purposes and/or used for members of the workforce transferring/transporting purposes:**	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	In quantitative monetary terms (e.g. £, $, etc.)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on the environmental impacts of transportation used for logistical purposes and/or used for members of the workforce transferring/transporting purposes	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{15.2}$	**Reporting on any efforts to reduce the impacts of transportation used for logistical purposes and/or used for members of the workforce transferring/transporting purposes:**	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Reporting on any efforts to reduce the impacts of transportation used for logistical purposes and/or used for members of the workforce transferring/transporting purposes	1	1	1	1	1	1	1	1	1	1	1	1	1	1

$RELE_i$	Relevance Indicators	Score by Two-Digit ISIC Rev.3.1[(a)]													
		32	33	35	40	41	45	51 52 55 74	61 62	64	65	66	70	72	92
	No reporting	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{15.3}$	**Specification of quantitative targets/timelines for the efforts to reduce the impacts of transportation used for logistical purposes and/or used for members of the workforce transferring/transporting purposes:**	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of short term quantitative targets/timelines (e.g. next year)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of long term quantitative targets/timelines (e.g. more than a year hence)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No specification of quantitative targets/timelines	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{16}$	**RISKS AND LIABILITIES** *Reporting on:* Risks and liabilities arising from the organisation's activities Risks to business itself: climate risk, risks from weather conditions, natural disaster/catastrophe likelihood, etc.	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**10**
$RELE_{16.1}$	**Risks and liabilities arising from the organisation's activities:**	***5***	***5***	***5***	***5***	***5***	***5***	***5***	***5***	***5***	***5***	***5***	***5***	***5***	***5***
$RELE_{16.1.1}$	**Reporting on environmental risks and liabilities arising from business activities:**	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	In quantitative monetary terms (e.g. £, $, etc.)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on the environmental risks and liabilities arising from business activities	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{16.1.2}$	**Reporting on any initiatives to cope with/mitigate such risks/liabilities (e.g. engaging with financial instruments/insurance to cover environmental risks/liabilities, indicating any work towards reducing the risks/liabilities):**	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Reporting on any initiatives to cope with/mitigate such risks/liabilities (e.g. engaging with financial instruments/insurance to cover environmental risks/liabilities, indicating any work towards reducing the risks/liabilities)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No reporting	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{16.1.3}$	**Specification of quantitative targets/timelines for the initiatives to cope with/mitigate such risks/liabilities:**	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of short term quantitative targets/timelines (e.g. next year)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of long term quantitative targets/timelines (e.g. more than a year hence)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No specification of quantitative targets/timelines	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{16.2}$	**Risks to business itself (e.g. climate risk, risks from weather conditions, natural disaster/catastrophe likelihood, etc.):**	***5***	***5***	***5***	***5***	***5***	***5***	***5***	***5***	***5***	***5***	***5***	***5***	***5***	***5***

$RELE_i$	Relevance Indicators	Score by Two-Digit ISIC Rev.3.1[(a)]													
		32	33	35	40	41	45	51 52 55 74	61 62	64	65	66	70	72	92
$RELE_{16.2.1}$	**Reporting on policies/programmes/designated management levels for consideration of such risks and reporting on such risks, segmented by type of risks:**	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	In quantitative monetary terms (e.g. £, $, etc.) (regarded as commercial risks)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	In qualitative terms	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No disclosure on the policies/programmes/designated management levels for consideration of such risks and reporting on such risks, segmented by type of risks	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{16.2.2}$	**Reporting on any initiatives to cope with/mitigate such risks (e.g. engaging with financial instruments/insurance to cover environmental risks):**	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Reporting on any initiatives to cope with/mitigate such risks (e.g. engaging with financial instruments/insurance to cover environmental risks)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No reporting	0	0	0	0	0	0	0	0	0	0	0	0	0	0
$RELE_{16.2.3}$	**Specification of quantitative targets/timelines for the initiatives to cope with/mitigate such risks:**	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of short term quantitative targets/timelines (e.g. next year)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Specification of long term quantitative targets/timelines (e.g. more than a year hence)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No specification of quantitative targets/timelines	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MAXIMUM TOTAL SCORE	72	72	61	175	72	106	50	139	68	139	139	95	54	61

(a) Eco-labelling scheme, in this case, means any schemes relating to a labelling system for company products that can help avoid detrimental effects on the environment and/or enable customers to choose greener products or identify those that have come from a sustainable source (European Commission, 2007b).
(b) The penultimate column contains the maximum scores for the main items and the italicised scores are the sub total maxima within these, which are employed in the weighting process, as discussed in chapter 4.

Appendix 3: A Detailed Scoring System for the Completeness Aspect of Reliability for Each of the Industry Sectors

$RELI_i$	Reliability Indicators	Score
$RELI_4$	**COMPLETENESS**	**3**
	Information shown in organisation environmental/annual report covers the entire range of significant issues[(a)]:	3
	Reporting on:	
	All ranges of significant issues (Full disclosure)	3
	Some ranges of significant issues (Disclosure of some issues)	2
	A limited range of significant issues (Disclosure of a limited range of significant issues)	1
	No disclosure or only a very limited range of significant issues are covered	0
	That is:	
	10 Mining of coal and lignite; extraction of peat	
	coal: in materials/resource ($RELE_1$), GHGs emissions ($RELE_5$), water ($RELE_3$), metal emissions to land ($RELE_{8.3}$), acid rain and smog precursor emissions ($RELE_7$), waste ($RELE_{10.1}$), energy ($RELE_2$), biodiversity ($RELE_4$), ODS emissions ($RELE_6$), major discharges to water ($RELE_{9.1}$), significant spills ($RELE_{11}$), products and services ($RELE_{13}$), compliance ($RELE_{14}$)	3
	At least coal: in materials/resource ($RELE_1$), GHGs emissions ($RELE_5$), water ($RELE_3$), metal emissions to land ($RELE_{8.3}$), acid rain and smog precursor emissions ($RELE_7$), waste ($RELE_{10.1}$)	2
	At least GHGs emissions ($RELE_5$)	1
	Nothing on the above issues or some of other above issues but GHGs emissions ($RELE_5$)	0
	11 Extraction of crude petroleum and natural gas; service activities incidental to oil and gas extraction excluding surveying	
	GHGs emissions ($RELE_5$), water ($RELE_3$), acid rain and smog precursor emissions ($RELE_7$), oil and natural gas: in materials/resource ($RELE_1$), waste ($RELE_{10.1}$)	3
	At least GHGs emissions ($RELE_5$), water ($RELE_3$), acid rain and smog precursor emissions ($RELE_7$)	2
	At least GHGs emissions ($RELE_5$)	1
	Nothing on the above issues or some of other above issues but GHGs emissions ($RELE_5$)	0
	13 Mining of metal ores	
	metals: in materials/resource ($RELE_1$), water ($RELE_3$), metal emissions to air ($RELE_{8.1}$), GHGs emissions ($RELE_5$), metal emissions to water ($RELE_{9.2}$), acid rain and smog precursor emissions ($RELE_7$), metal emissions to land ($RELE_{8.3}$), waste ($RELE_{10.1}$), pesticide and fertiliser emissions ($RELE_{8.4}$), energy ($RELE_2$), biodiversity ($RELE_4$), ODS emissions ($RELE_6$), major discharges to water ($RELE_{9.1}$), significant spills ($RELE_{11}$), products and services ($RELE_{13}$), compliance ($RELE_{14}$)	3
	At least metals: in materials/resource ($RELE_1$), water ($RELE_3$), metal emissions to air ($RELE_{8.1}$), GHGs emissions ($RELE_5$), metal emissions to water ($RELE_{9.2}$), acid rain and smog precursor emissions ($RELE_7$), metal	2

$RELI_i$	Reliability Indicators	Score
	emissions to land ($RELE_{8.3}$), waste ($RELE_{10.1}$), pesticide and fertiliser emissions ($RELE_{8.4}$)	
	At least GHGs emissions ($RELE_5$)	1
	Nothing on the above issues or some of other above issues but GHGs emissions ($RELE_5$)	0
	15 Manufacture of food products and beverages	
	water ($RELE_3$), GHGs emissions ($RELE_5$), waste ($RELE_{10.1}$), acid rain and smog precursor emissions ($RELE_7$), nutrients and organic pollutants: in major discharges to water ($RELE_{9.1}$), materials/resource ($RELE_1$), energy ($RELE_2$), biodiversity ($RELE_4$), ODS emissions ($RELE_6$), significant spills ($RELE_{11}$), products and services ($RELE_{13}$), compliance ($RELE_{14}$), transportation ($RELE_{15}$)	3
	At least water ($RELE_3$), GHGs emissions ($RELE_5$), waste ($RELE_{10.1}$), acid rain and smog precursor emissions ($RELE_7$), nutrients and organic pollutants: in major discharges to water ($RELE_{9.1}$)	2
	At least GHGs emissions ($RELE_5$)	1
	Nothing on the above issues or some of other above issues but GHGs emissions ($RELE_5$)	0
	16 Manufacture of tobacco products	
	water ($RELE_3$), waste ($RELE_{10.1}$), GHGs emissions ($RELE_5$)	3
	At least water ($RELE_3$), waste ($RELE_{10.1}$)	2
	At least GHGs emissions ($RELE_5$), but water ($RELE_3$) or waste ($RELE_{10.1}$)	1
	Nothing on the above issues	0
	21 Manufacture of paper and paper products	
	water ($RELE_3$), GHGs emissions ($RELE_5$), waste ($RELE_{10.1}$), VOC emissions ($RELE_{8.2}$), acid rain and smog precursor emissions ($RELE_7$), metal emissions to land ($RELE_{8.3}$), metal emissions to water ($RELE_{9.2}$), nutrients and organic pollutants: in major discharges to water ($RELE_{9.1}$)	3
	At least water ($RELE_3$), GHGs emissions ($RELE_5$), waste ($RELE_{10.1}$), VOC emissions ($RELE_{8.2}$)	2
	At least GHGs emissions ($RELE_5$)	1
	Nothing on the above issues or some of other above issues but GHGs emissions ($RELE_5$)	0
	22 Publishing, printing and reproduction of recorded media	
	GHGs emissions ($RELE_5$), waste ($RELE_{10.1}$), water ($RELE_3$), metal emissions to land ($RELE_{8.3}$), acid rain and smog precursor emissions ($RELE_7$), VOC emissions ($RELE_{8.2}$)	3
	At least GHGs emissions ($RELE_5$), waste ($RELE_{10.1}$), water ($RELE_3$)	2
	At least GHGs emissions ($RELE_5$)	1
	Nothing on the above issues or some of other above issues but GHGs emissions ($RELE_5$)	0
	23 Manufacture of coke, refined petroleum products and nuclear fuel	
	GHGs emissions ($RELE_5$), water ($RELE_3$), metal emissions to land ($RELE_{8.3}$), acid rain and smog precursor emissions ($RELE_7$), waste ($RELE_{10.1}$), metal emissions to air ($RELE_{8.1}$), radioactive waste ($RELE_{10.2}$)	3
	At least GHGs emissions ($RELE_5$), water ($RELE_3$), metal emissions to land ($RELE_{8.3}$), acid rain and smog precursor emissions ($RELE_7$)	2
	At least GHGs emissions ($RELE_5$)	1

$RELI_i$	Reliability Indicators	Score
	Nothing on the above issues or some of other above issues but GHGs emissions ($RELE_5$)	0
	24 Manufacture of chemicals and chemical products	
	water ($RELE_3$), GHGs emissions ($RELE_5$), metal emissions to land ($RELE_{8.3}$), waste ($RELE_{10.1}$), VOC emissions ($RELE_{8.2}$), metal emissions to air ($RELE_{8.1}$), ODS emissions ($RELE_6$), nutrients and organic pollutants: in major discharges to water ($RELE_{9.1}$), acid rain and smog precursor emissions ($RELE_7$)	3
	At least water ($RELE_3$), GHGs emissions ($RELE_5$), metal emissions to land ($RELE_{8.3}$), waste ($RELE_{10.1}$), VOC emissions ($RELE_{8.2}$)	2
	At least GHGs emissions ($RELE_5$)	1
	Nothing on the above issues or some of other above issues but GHGs emissions ($RELE_5$)	0
	26 Manufacture of other non-metallic mineral products	
	GHGs emissions ($RELE_5$), acid rain and smog precursor emissions ($RELE_7$), waste ($RELE_{10.1}$), metal emissions to air ($RELE_{8.1}$), metal emissions to land ($RELE_{8.3}$), water ($RELE_3$)	3
	At least GHGs emissions ($RELE_5$), acid rain and smog precursor emissions ($RELE_7$), waste ($RELE_{10.1}$)	2
	At least GHGs emissions ($RELE_5$)	1
	Nothing on the above issues or some of other above issues but GHGs emissions ($RELE_5$)	0
	27 Manufacture of basic metals	
	water ($RELE_3$), metal emissions to land ($RELE_{8.3}$), GHGs emissions ($RELE_5$), waste ($RELE_{10.1}$), metal emissions to air ($RELE_{8.1}$), acid rain and smog precursor emissions ($RELE_7$), materials/resource ($RELE_1$), energy ($RELE_2$), biodiversity ($RELE_4$), ODS emissions ($RELE_6$), major discharges to water ($RELE_{9.1}$), significant spills ($RELE_{11}$), products and services ($RELE_{13}$), compliance ($RELE_{14}$)	3
	At least water ($RELE_3$), metal emissions to land ($RELE_{8.3}$), GHGs emissions ($RELE_5$), waste ($RELE_{10.1}$), metal emissions to air ($RELE_{8.1}$), acid rain and smog precursor emissions ($RELE_7$)	2
	At least GHGs emissions ($RELE_5$)	1
	Nothing on the above issues or some of other above issues but GHGs emissions ($RELE_5$)	0
	28 Manufacture of fabricated metal products, except for machinery and equipment	
	GHGs emissions ($RELE_5$), water ($RELE_3$), waste ($RELE_{10.1}$), acid rain and smog precursor emissions ($RELE_7$), materials/resource ($RELE_1$), energy ($RELE_2$), biodiversity ($RELE_4$), ODS emissions ($RELE_6$), major discharges to water ($RELE_{9.1}$), significant spills ($RELE_{11}$), products and services ($RELE_{13}$), compliance ($RELE_{14}$)	3
	At least GHGs emissions ($RELE_5$), water ($RELE_3$), waste ($RELE_{10.1}$), acid rain and smog precursor emissions ($RELE_7$)	2
	At least GHGs emissions ($RELE_5$)	1
	Nothing on the above issues or some of other above issues but GHGs emissions ($RELE_5$)	0
	29 Manufacture of machinery and equipment n.e.c.	
	30 Manufacture of office, accounting and computing machinery	
	GHGs emissions ($RELE_5$), water ($RELE_3$), waste ($RELE_{10.1}$), metal emissions to land ($RELE_{8.3}$)	3
	At least GHGs emissions ($RELE_5$), water ($RELE_3$)	2
	At least GHGs emissions ($RELE_5$)	1

$RELI_i$	Reliability Indicators	Score
	Nothing on the above issues or some of other above issues but GHGs emissions ($RELE_5$)	0
	32 Manufacture of radio, television and communication equipment and apparatus	
	GHGs emissions ($RELE_5$), water ($RELE_3$), metal emissions to land ($RELE_{8.3}$), waste ($RELE_{10.1}$)	3
	At least GHGs emissions ($RELE_5$), water ($RELE_3$)	2
	At least GHGs emissions ($RELE_5$)	1
	Nothing on the above issues or some of other above issues but GHGs emissions ($RELE_5$)	0
	33 Manufacture of medical, precision and optical instruments, watches and clocks	
	GHGs emissions ($RELE_5$), acid rain and smog precursor emissions ($RELE_7$), water ($RELE_3$), waste ($RELE_{10.1}$)	3
	At least GHGs emissions ($RELE_5$), acid rain and smog precursor emissions ($RELE_7$)	2
	At least GHGs emissions ($RELE_5$)	1
	Nothing on the above issues or some of other above issues but GHGs emissions ($RELE_5$)	0
	35 Manufacture of other transport equipment	
	GHGs emissions ($RELE_5$), water ($RELE_3$), waste ($RELE_{10.1}$)	3
	At least GHGs emissions ($RELE_5$), water ($RELE_3$)	2
	At least GHGs emissions ($RELE_5$)	1
	Nothing on the above issues or some of other above issues but GHGs emissions ($RELE_5$)	0
	40 Electricity, gas, steam and hot water supply	
	GHGs emissions ($RELE_5$), waste ($RELE_{10.1}$), acid rain and smog precursor emissions ($RELE_7$), radioactive waste ($RELE_{10.2}$), water ($RELE_3$), metal emissions to land ($RELE_{8.3}$), metal emissions to air ($RELE_{8.1}$), metal emissions to water ($RELE_{9.2}$), materials/resource ($RELE_1$), energy ($RELE_2$), biodiversity ($RELE_4$), ODS emissions ($RELE_6$), major discharges to water ($RELE_{9.1}$), significant spills ($RELE_{11}$), products and services ($RELE_{13}$), compliance ($RELE_{14}$)	3
	At least GHGs emissions ($RELE_5$), waste ($RELE_{10.1}$), acid rain and smog precursor emissions ($RELE_7$), radioactive waste ($RELE_{10.2}$), water ($RELE_3$), metal emissions to land ($RELE_{8.3}$), metal emissions to air ($RELE_{8.1}$), metal emissions to water ($RELE_{9.2}$)	2
	At least GHGs emissions ($RELE_5$)	1
	Nothing on the above issues or some of other above issues but GHGs emissions ($RELE_5$)	0
	41 Collection, purification and distribution of water	
	water ($RELE_3$), GHGs emissions ($RELE_5$), acid rain and smog precursor emissions ($RELE_7$), nutrients and organic pollutants: in major discharges to water ($RELE_{9.1}$)	3
	At least water ($RELE_3$), GHGs emissions ($RELE_5$)	2
	At least GHGs emissions ($RELE_5$)	1
	Nothing on the above issues or some of other above issues but GHGs emissions ($RELE_5$)	0

$RELI_i$	Reliability Indicators	Score
45 Construction		
	GHGs emissions ($RELE_5$), water ($RELE_3$), acid rain and smog precursor emissions ($RELE_7$), waste ($RELE_{10.1}$), materials/resource ($RELE_1$), energy ($RELE_2$), compliance ($RELE_{14}$), transportation ($RELE_{15}$)	3
	At least GHGs emissions ($RELE_5$), water ($RELE_3$), acid rain and smog precursor emissions ($RELE_7$), waste ($RELE_{10.1}$)	2
	At least GHGs emissions ($RELE_5$)	1
	Nothing on the above issues or some of other above issues but GHGs emissions ($RELE_5$)	0
51 Wholesale trade and commission trade, except for motor vehicles and motorcycles		
52 Retail trade, except for motor vehicles and motorcycles; repair of personal and household goods		
55 Hotels and restaurants		
74 Other business activities		
	GHGs emissions ($RELE_5$), waste ($RELE_{10.1}$)	3
	At least GHGs emissions ($RELE_5$)	2
	At least waste ($RELE_{10.1}$) but GHGs emissions ($RELE_5$)	1
	Nothing on the above issues	0
61 Water transport		
62 Air transport		
	GHGs emissions ($RELE_5$), acid rain and smog precursor emissions ($RELE_7$), waste ($RELE_{10.1}$), materials/resource ($RELE_1$), energy ($RELE_2$), water ($RELE_3$), biodiversity ($RELE_4$), ODS emissions ($RELE_6$), major discharges to water ($RELE_{9.1}$), significant spills ($RELE_{11}$), products and services ($RELE_{13}$), compliance ($RELE_{14}$)	3
	At least GHGs emissions ($RELE_5$), acid rain and smog precursor emissions ($RELE_7$), waste ($RELE_{10.1}$)	2
	At least GHGs emissions ($RELE_5$)	1
	Nothing on the above issues or some of other above issues but GHGs emissions ($RELE_5$)	0
64 Post and telecommunications		
	GHGs emissions ($RELE_5$), waste ($RELE_{10.1}$), materials/resource ($RELE_1$), biodiversity ($RELE_4$)	3
	At least GHGs emissions ($RELE_5$), waste ($RELE_{10.1}$)	2
	At least GHGs emissions ($RELE_5$)	1
	Nothing on the above issues or some of other above issues but GHGs emissions ($RELE_5$)	0
65 Financial intermediation, except for insurance and pension funding		
	GHGs emissions ($RELE_5$), waste ($RELE_{10.1}$), materials/resource ($RELE_1$), energy ($RELE_2$), water ($RELE_3$), biodiversity ($RELE_4$), ODS emissions ($RELE_6$), acid rain and smog precursor emissions ($RELE_7$), major discharges to water ($RELE_{9.1}$), significant spills ($RELE_{11}$), products and services ($RELE_{13}$), compliance ($RELE_{14}$)	3
	At least GHGs emissions ($RELE_5$), waste ($RELE_{10.1}$)	2

$RELI_i$	Reliability Indicators	Score
	At least GHGs emissions ($RELE_5$)	1
	Nothing on the above issues or some of other above issues but GHGs emissions ($RELE_5$)	0
	66 Insurance and pension funding, except for compulsory social security	
	GHGs emissions ($RELE_5$), materials/resource ($RELE_1$), energy ($RELE_2$), water ($RELE_3$), biodiversity ($RELE_4$), ODS emissions ($RELE_6$), acid rain and smog precursor emissions ($RELE_7$), major discharges to water ($RELE_{9.1}$), waste ($RELE_{10.1}$), significant spills ($RELE_{11}$), products and services ($RELE_{13}$), compliance ($RELE_{14}$)	3
	At least GHGs emissions ($RELE_5$)	2
	At least materials/resource ($RELE_1$) or energy ($RELE_2$) or water ($RELE_3$) or biodiversity ($RELE_4$) or ODS emissions ($RELE_6$) or acid rain and smog precursor emissions ($RELE_7$) or major discharges to water ($RELE_{9.1}$) or waste ($RELE_{10.1}$) or significant spills ($RELE_{11}$) or products and services ($RELE_{13}$) or compliance ($RELE_{14}$), but GHGs emissions ($RELE_5$)	1
	Nothing on the above issues	0
	70 Real estate activities	
	GHGs emissions ($RELE_5$), waste ($RELE_{10.1}$), materials/resource ($RELE_1$), energy ($RELE_2$), water ($RELE_3$), compliance ($RELE_{14}$), transportation ($RELE_{15}$)	3
	At least GHGs emissions ($RELE_5$), waste ($RELE_{10.1}$)	2
	At least GHGs emissions ($RELE_5$)	1
	Nothing on the above issues or some of other above issues but GHGs emissions ($RELE_5$)	0
	72 Computer and related activities	
	GHGs emissions ($RELE_5$), acid rain and smog precursor emissions ($RELE_7$)	3
	At least GHGs emissions ($RELE_5$)	2
	At least acid rain and smog precursor emissions ($RELE_7$) but GHGs emissions ($RELE_5$)	1
	Nothing on the above issues	0
	92 Recreational, cultural and sporting activities	
	GHGs emissions ($RELE_5$), acid rain and smog precursor emissions ($RELE_7$), waste ($RELE_{10.1}$)	3
	At least GHGs emissions ($RELE_5$), acid rain and smog precursor emissions ($RELE_7$)	2
	At least GHGs emissions ($RELE_5$)	1
	Nothing on the above issues or some of other above issues but GHGs emissions ($RELE_5$)	0

(a) The indicators regarding the completeness aspect of reliability and the score ($RELI_4$) for each industry sector are drawn from the significant issues attributed to the relevance characteristic, as shown in table 4.4.

Appendix 4: Spearman Correlation Matrix of $CERQ_{jt}$ Components

Restricted Sample:

	U_1	U_2	U_3	U_4	U_5	$U_{6.1}$	$U_{6.2}$	U_{jt}	$RELE_{1.1}$ to $RELE_{15.3}$	$RELE_{16.1.1}$	$RELE_{16.1.2}$	$RELE_{16.1.3}$	$RELE_{16.2.1}$	$RELE_{16.2.2}$	$RELE_{16.2.3}$	$RELE_{jt}$
U_1	1.0000															
U_2	-0.0986	1.0000														
U_3	-0.0397	0.0462	1.0000													
U_4	0.0452	0.1480*	0.1452*	1.0000												
U_5	0.0326	0.2133***	0.0697	0.0468	1.0000											
$U_{6.1}$	0.0267	-0.0677	0.0264	0.0234	0.1793**	1.0000										
$U_{6.2}$	0.0937	0.2762***	0.1010	0.3261***	0.2139***	-0.0366	1.0000									
U_{jt}	0.9656***	0.0424	0.0606	0.0932	0.1972**	0.0797	0.1639**	1.0000								
$RELE_{1.1}$ to $RELE_{15.3}$	-0.0271	0.3737***	0.2634***	0.3654***	-0.0079	0.0403	0.1905**	0.0600	1.0000							
$RELE_{16.1.1}$	-0.2230***	0.1109	0.0374	0.0883	-0.0552	0.0404	0.1478*	-0.2164***	0.0680	1.0000						
$RELE_{16.1.2}$	0.0303	0.1038	0.1150	0.0269	-0.0848	-0.1048	0.1565**	0.0308	0.1278	0.1594**	1.0000					
$RELE_{16.1.3}$	0.1310	0.0792	0.0704	0.0371	-0.0261	-0.0338	0.0600	0.1368*	-0.0027	-0.0517	0.1716**	1.0000				
$RELE_{16.2.1}$	-0.0118	0.1892**	0.0563	-0.1401*	0.1638**	0.0282	0.0858	0.0260	0.0258	-0.0552	0.1142	0.0371	1.0000			
$RELE_{16.2.2}$	-0.0399	0.1207	0.0824	-0.1672**	0.0951	0.0477	0.0670	-0.0169	0.0264	0.0465	0.1425*	0.0350	0.7829***	1.0000		
$RELE_{16.2.3}$	-0.0323	0.0467	0.1270	0.0393	0.0623	0.0366	0.0128	-0.0124	0.1440*	0.0577	0.0367	-0.0600	0.1435*	0.1913**	1.0000	
$RELE_{jt}$	-0.0268	0.3758***	0.2654***	0.3648***	-0.0064	0.0429	0.1912**	0.0604	0.9998***	0.0728	0.1304	0.0039	0.0339	0.0342	0.1440*	1.0000

	$RELI_{1.1}$	$RELI_{2.1}$	$RELI_{2.2}$	$RELI_{2.3}$	$RELI_{2.4}$	$RELI_{2.5}$	$RELI_{2.6}$	$RELI_3$	$RELI_4$	$RELI_{5.1.1}$	$RELI_{5.1.2}$	$RELI_{5.1.3}$	$RELI_{5.2.1}$	$RELI_{5.2.2}$	$RELI_{5.2.3}$	$RELI_{jt}$	$C_{1.1}$	$C_{1.2}$	C_{jt}
$RELI_{1.1}$	1.0000																		
$RELI_{2.1}$	0.7791***	1.0000																	
$RELI_{2.2}$	0.4216***	0.5440***	1.0000																
$RELI_{2.3}$	0.8050***	0.8340***	0.5758***	1.0000															
$RELI_{2.4}$	0.3673***	0.2963***	0.0478	0.2947***	1.0000														
$RELI_{2.5}$	0.6124***	0.6025***	0.3492***	0.6002***	0.3762***	1.0000													
$RELI_{2.6}$	0.3466***	0.3616***	0.2093***	0.3128***	0.2129***	0.2923***	1.0000												
$RELI_3$	0.1220	0.0589	0.0333	0.1136	0.0689	0.1001	0.0385	1.0000											
$RELI_4$	-0.0003	-0.0978	-0.1905**	-0.0095	-0.0299	-0.0939	-0.0138	0.0426	1.0000										
$RELI_{5.1.1}$	-0.2135***	-0.2105***	-0.1125	-0.2016**	0.0226	-0.1060	-0.1556*	0.1871**	-0.1023	1.0000									
$RELI_{5.1.2}$	0.1225	0.0729	-0.0575	0.0595	0.1404*	0.0811	0.1197	0.1270	0.0819	0.1594**	1.0000								
$RELI_{5.1.3}$	0.0928	0.0574	-0.0028	0.1285	0.1195	0.1264	-0.0127	-0.0053	-0.0421	-0.0273	0.1836**	1.0000							
$RELI_{5.2.1}$	0.2911***	0.2919***	0.0774	0.2509***	-0.0564	0.2215***	0.0351	-0.1245	0.0619	-0.0552	0.1142	0.0746	1.0000						
$RELI_{5.2.2}$	0.2126***	0.1621**	0.0347	0.1640**	0.0203	0.1560*	0.0475	-0.1462*	0.0637	0.0465	0.1425*	0.0900	0.7829***	1.0000					
$RELI_{5.2.3}$	0.0635	0.1624**	0.0866	0.1320*	-0.0491	-0.0770	-0.0419	0.0265	0.1331*	0.0577	0.0367	-0.0642	0.1435*	0.1913**	1.0000				
$RELI_{jt}$	0.8343***	0.7885***	0.4438***	0.8132***	0.4124***	0.6668***	0.3952***	0.2938***	0.1648**	-0.0457	0.2594***	0.2816***	0.4325***	0.3797***	0.1863**	1.0000			
$C_{1.1}$	0.0211	-0.0196	-0.1497*	0.0019	0.0119	-0.0903	0.0148	0.0617	0.3590***	-0.0036	0.0257	0.0193	0.0529	0.0647	-0.0014	0.0818	1.0000		
$C_{1.2}$	-0.0186	-0.0515	-0.0135	0.0414	-0.0876	-0.1952**	-0.0566	0.0341	0.4644***	-0.0837	0.0014	-0.0415	-0.0226	-0.0842	-0.0804	0.0164	0.2457***	1.0000	
C_{jt}	-0.0073	-0.0484	-0.1113	0.0153	-0.0421	-0.1750**	-0.0201	0.0624	0.5136***	-0.0478	0.0231	-0.0086	0.0206	-0.0091	-0.0478	0.0594	0.8157***	0.7576***	1.0000

* denotes significant at the 10% level. ** denotes significant at the 5% level. *** denotes significant at the 1% level.

Full Sample:

	U_1	U_2	U_3	U_4	U_5	$U_{6.1}$	$U_{6.2}$	U_{jt}	$RELE_{1.1}$ to $RELE_{15.3}$	$RELE_{16.1.1}$	$RELE_{16.1.2}$	$RELE_{16.1.3}$	$RELE_{16.2.1}$	$RELE_{16.2.2}$	$RELE_{16.2.3}$	$RELE_{jt}$
U_1	1.0000															
U_2	0.0947*	1.0000														
U_3	0.0988*	0.3299***	1.0000													
U_4	0.1078**	0.5781***	0.4086***	1.0000												
U_5	0.1453***	0.4867***	0.2876***	0.3588***	1.0000											
$U_{6.1}$	0.2290***	0.3550***	0.2311***	0.3046***	0.3941***	1.0000										
$U_{6.2}$	0.1864***	0.5871***	0.3831***	0.6698***	0.6265***	0.4098***	1.0000									
U_{jt}	0.9351***	0.3444***	0.2658***	0.3180***	0.3777***	0.3644***	0.4010***	1.0000								
$RELE_{1.1}$ to $RELE_{15.3}$	0.1716***	0.6971***	0.4556***	0.6660***	0.4711***	0.4345***	0.6690***	0.3836***	1.0000							
$RELE_{16.1.1}$	-0.0839	0.2343***	0.1197**	0.3712***	0.2229***	0.1797***	0.3610***	0.0104	0.3149***	1.0000						
$RELE_{16.1.2}$	0.1520***	0.3526***	0.2959***	0.4378***	0.2844***	0.3740***	0.5078***	0.2503***	0.4729***	0.4703***	1.0000					
$RELE_{16.1.3}$	0.1869***	0.1861***	0.2608***	0.2631***	0.0752	0.1908***	0.2137***	0.2492***	0.2622***	0.0070	0.2559***	1.0000				
$RELE_{16.2.1}$	-0.0815	-0.0731	-0.0467	-0.1297**	0.0370	-0.0995*	-0.0551	-0.0851	-0.1015*	-0.0258	-0.0602	-0.0190	1.0000			
$RELE_{16.2.2}$	-0.0062	0.0947*	0.0446	0.0106	0.0530	0.0538	0.0397	0.0152	0.0525	0.0612	0.0548	0.0374	0.6573***	1.0000		
$RELE_{16.2.3}$	-0.0146	0.0699	0.1063**	0.0540	0.0656	0.0469	0.0407	0.0150	0.1135**	0.0528	0.0391	-0.0367	0.0819	0.1387***	1.0000	
$RELE_{jt}$	0.1734***	0.6961***	0.4560***	0.6675***	0.4709***	0.4321***	0.6680***	0.3853***	0.9993***	0.3248***	0.4790***	0.2670***	-0.0889*	0.0638	0.1134**	1.0000

	$RELI_{1.1}$	$RELI_{2.1}$	$RELI_{2.2}$	$RELI_{2.3}$	$RELI_{2.4}$	$RELI_{2.5}$	$RELI_{2.6}$	$RELI_3$	$RELI_4$	$RELI_{5.1.1}$	$RELI_{5.1.2}$	$RELI_{5.1.3}$	$RELI_{5.2.1}$	$RELI_{5.2.2}$	$RELI_{5.2.3}$	$RELI_{jt}$	$C_{1.1}$	$C_{1.2}$	C_{jt}
$RELI_{1.1}$	1.0000																		
$RELI_{2.1}$	0.8575***	1.0000																	
$RELI_{2.2}$	0.4794***	0.5351***	1.0000																
$RELI_{2.3}$	0.8120***	0.8438***	0.6177***	1.0000															
$RELI_{2.4}$	0.4717***	0.4147***	0.1616***	0.3692***	1.0000														
$RELI_{2.5}$	0.7052***	0.6995***	0.4202***	0.6940***	0.4262***	1.0000													
$RELI_{2.6}$	0.4389***	0.4782***	0.2967***	0.3880***	0.2472***	0.3661***	1.0000												
$RELI_3$	0.4724***	0.3928***	0.2590***	0.3777***	0.2257***	0.3278***	0.2231***	1.0000											
$RELI_4$	0.2873***	0.1811***	0.0588	0.2146***	0.1398***	0.1651***	0.0968*	0.3336***	1.0000										
$RELI_{5.1.1}$	0.0207	-0.0152	0.0017	-0.0104	0.0562	0.0053	-0.0394	0.2468***	0.2223***	1.0000									
$RELI_{5.1.2}$	0.2618***	0.2212***	0.0695	0.1793***	0.1260**	0.1743***	0.1549***	0.3363***	0.4377***	0.4703***	1.0000								
$RELI_{5.1.3}$	0.1678***	0.1631***	0.0785	0.1762***	0.1346**	0.2117***	0.0539	0.2390***	0.1943***	0.0230	0.2647***	1.0000							
$RELI_{5.2.1}$	0.1069**	0.1112**	0.0626	0.0903*	-0.0407	0.0893*	0.0094	-0.0982*	-0.0651	-0.0258	-0.0602	-0.0042	1.0000						
$RELI_{5.2.2}$	0.1877***	0.1491***	0.0526	0.1069**	0.0248	0.1335**	0.0356	0.0559	0.0573	0.0612	0.0548	0.0665	0.6573***	1.0000					
$RELI_{5.2.3}$	0.0909*	0.1427***	0.0959*	0.1344**	-0.0246	-0.0372	-0.0222	0.0747	0.1010*	0.0528	0.0391	-0.0379	0.0819	0.1387***	1.0000				
$RELI_{jt}$	0.8010***	0.7303***	0.4415***	0.7013***	0.4143***	0.6272***	0.3929***	0.7130***	0.5820***	0.3219***	0.5483***	0.3881***	0.1632***	0.2937***	0.1252**	1.0000			
$C_{1.1}$	0.1508***	0.0955*	-0.0509	0.1027*	0.0471	0.0359	0.0407	0.1492***	0.3369***	0.2068***	0.1647***	0.0400	-0.0442	0.0322	0.0129	0.2357***	1.0000		
$C_{1.2}$	0.1452***	0.0893*	0.0590	0.1438***	0.0114	-0.0360	0.0232	0.1505***	0.4590***	0.0809	0.1847***	0.0143	-0.1199**	-0.0876*	-0.0423	0.2272***	0.2756***	1.0000	
C_{jt}	0.1681***	0.1046**	-0.0054	0.1345**	0.0361	0.0094	0.0387	0.1866***	0.4847***	0.2018***	0.2287***	0.0460	-0.0973*	-0.0265	-0.0111	0.2869***	0.8538***	0.7193***	1.0000

* denotes significant at the 10% level. ** denotes significant at the 5% level. *** denotes significant at the 1% level.

Appendix 5: Regression Results by Measure Using Pooled Tobit, Random-Effects Tobit and Pooled Ordinary Least Squares Estimations

Using Pooled Tobit Estimation

Explanatory Variables	**Dependent Variables**				
	Total CER Quality, Q_{jt}	Understandability, U_{jt}	Relevance, $RELE_{jt}$	Reliability, $RELI_{jt}$	Comparability and Consistency, C_{jt}
Constant	0.4380	7.7269**	2.1652	-16.0082	11.1353
	(0.02)	(2.40)	(0.31)	(-1.63)	(0.25)
$SIZE_{jt}$ [a]	1.7768*	0.1040	0.1928	1.0347***	0.3771
	(1.73)	(0.80)	(0.72)	(2.68)	(0.22)
$INDUSTRY10_{jt}$					
$INDManu_{jt}$	-12.6254***	-0.4267	-1.2496	-2.0121	-21.9672***
	(-2.94)	(-1.03)	(-1.16)	(-1.56)	(-2.65)
$INDUtilities_{jt}$	-9.7749*	-0.2661	-2.0381	-0.7338	-15.4429
	(-1.87)	(-0.57)	(-1.41)	(-0.62)	(-1.48)
$INDTrade_{jt}$	2.9472	0.7909	-0.7589	-3.6070**	109.0883
	(0.63)	(1.46)	(-0.62)	(-2.02)	(.) [a]
$INDTransport_{jt}$	-7.5943	-0.7143	-2.8161***	-1.1803	-5.0804
	(-1.46)	(-1.30)	(-2.94)	(-0.71)	(-0.49)
$INDFinance_{jt}$	-23.0707***	-0.5580	-3.2101**	-1.9012	-39.3048***
	(-4.02)	(-0.84)	(-2.49)	(-0.80)	(-2.76)
$INDRealEstate_{jt}$	-14.6344***	-0.0454	-1.9922	-2.7348	-22.9052**
	(-2.65)	(-0.07)	(-1.11)	(-1.50)	(-2.31)
$INDOthers_{jt}$	-16.6431**	1.4816**	-6.2584***	-1.6095	-15.4850
	(-2.53)	(2.30)	(-3.24)	(-0.89)	(-1.36)
$COUNTRY_{jt}$	9.4249***	1.0653***	1.3788**	5.6494***	2.5831
	(3.82)	(4.40)	(2.03)	(8.95)	(0.55)
$CROSS\ LISTING_{jt}$	1.3720	0.4268*	-0.0604	-0.8238	4.5758
	(0.74)	(1.76)	(-0.11)	(-1.19)	(1.13)
$SALES\ OUTS_{jt}$	-0.0301	-0.0090	-0.0325**	-0.0027	0.0370
	(-0.66)	(-1.56)	(-2.41)	(-0.16)	(0.41)
$FIN\ PERF_{jt}$	0.0358***	-0.0006	0.0091*	0.0021	0.1198**
	(2.91)	(-0.56)	(1.95)	(0.65)	(2.07)
$EMISSIONS_{jt}$	-1.8692***	-0.2041**	0.1697	0.0818	-4.6734***
	(-2.93)	(-2.50)	(0.83)	(0.32)	(-3.14)
$GRI\ APP_{jt}$	5.0723***	0.1825	1.5910***	0.8307	7.1713*
	(2.82)	(0.72)	(3.16)	(1.36)	(1.72)
$INDEX_{jt}$	1.7709	0.0469	1.0030*	-0.4527	2.8800
	(0.66)	(0.17)	(1.79)	(-0.65)	(0.57)
$YEAR_{jt}$	2.9107**	0.3069	0.4029	-0.1036	6.6964**
	(2.44)	(1.55)	(1.45)	(-0.31)	(2.39)
Pseudo R^2:					
McFadden's Adjusted R^2	0.048	0.061	0.033	0.077	0.054
Nagelkerke R^2	0.463	0.384	0.336	0.495	0.390
Log pseudolikelihood	-579.3455	-261.1369	-367.5407	-395.3391	-324.4248
F	23.95	9.95	6.53	12.84	. [b]
Prob > F	0.0000	0.0000	0.0000	0.0000	. [b]
Number of Observations	158	158	158	158	158

The *t*-statistics are the *t*-values adjusted for heteroskedasticity consistent standard errors.
* denotes significant at the 10% level. ** denotes significant at the 5% level. *** denotes significant at the 1% level.
(a) By natural logarithm of total assets
(b) The standard error is reported as missing and the coefficient could not be estimated in the normal statistical sense, since the C_{jt} appears to be censored but normal data (arguably ordinal). In addition, this model does not meet requirement of the heteroskedasticity consistent standard errors, hence the F statistic is reported as missing.

Using Random-Effects Tobit Estimation

Explanatory Variables	**Dependent Variables**				
	Total CER Quality, Q_{it}	Understandability, U_{it}	Relevance, $RELE_{it}$	Reliability, $RELI_{it}$	Comparability and Consistency, C_{it}
Constant	-7.3487	7.5973**	-1.5549	-16.9707**	9.2015
	(-0.28)	(2.36)	(-0.22)	(-2.00)	(0.18)
$SIZE_{it}$ [(a)]	2.1138**	0.1104	0.3560	1.0934***	0.5717
	(2.03)	(0.86)	(1.25)	(3.23)	(0.28)
$INDUSTRY10_{it}$					
$INDManu_{it}$	-12.8027***	-0.4109	-1.2025	-2.0559*	-23.2980***
	(-3.56)	(-0.92)	(-1.23)	(-1.76)	(-3.13)
$INDUtilities_{it}$	-11.3251**	-0.2677	-2.2489*	-0.9913	-18.2264*
	(-2.29)	(-0.44)	(-1.65)	(-0.61)	(-1.85)
$INDTrade_{it}$	2.4322	0.7609	-0.6940	-3.4777*	81.5123
	(0.44)	(1.10)	(-0.46)	(-1.94)	(0.04)
$INDTransport_{it}$	-8.8045*	-0.7478	-2.8256**	-1.7557	-7.7056
	(-1.71)	(-1.17)	(-2.01)	(-1.05)	(-0.76)
$INDFinance_{it}$	-24.6716***	-0.5761	-3.4404**	-2.3212	-42.3516***
	(-3.98)	(-0.74)	(-2.06)	(-1.17)	(-3.17)
$INDRealEstate_{it}$	-15.0036***	0.0365	-1.8208	-2.9349*	-24.5594**
	(-2.98)	(0.06)	(-1.33)	(-1.80)	(-2.42)
$INDOthers_{it}$	-17.1716**	1.4971	-6.1886***	-1.7146	-19.0558
	(-2.28)	(1.52)	(-3.10)	(-0.72)	(-1.23)
$COUNTRY_{it}$	9.3830***	1.0702***	1.4540**	5.5642***	2.6309
	(3.92)	(3.63)	(2.20)	(7.08)	(0.57)
$CROSS\ LISTING_{it}$	1.6625	0.4115*	-0.1087	-0.7275	5.1090
	(0.84)	(1.65)	(-0.20)	(-1.14)	(1.26)
$SALES\ OUTS_{it}$	-0.0434	-0.0091	-0.0339***	-0.0093	0.0084
	(-0.95)	(-1.58)	(-2.85)	(-0.65)	(0.09)
$FIN\ PERF_{it}$	0.0342**	-0.0007	0.0096***	0.0012	0.1130*
	(2.55)	(-0.37)	(2.70)	(0.29)	(1.93)
$EMISSIONS_{it}$	-1.7972***	-0.2060**	0.1829	0.0933	-4.6752***
	(-2.84)	(-2.49)	(1.14)	(0.48)	(-3.40)
$GRI\ APP_{it}$	3.8757**	0.2030	1.2026**	0.7590	5.3418
	(2.06)	(0.83)	(2.55)	(1.33)	(1.30)
$INDEX_{it}$	2.1864	0.0133	0.6525	-0.4245	3.7872
	(1.00)	(0.05)	(1.12)	(-0.61)	(0.86)
$YEAR_{it}$	3.1849***	0.3103	0.4735*	-0.1387	6.8271**
	(2.73)	(1.62)	(1.88)	(-0.44)	(2.49)
Log likelihood	-570.9863	-260.7518	-349.5978	-380.3405	-321.2304
Wald χ^2	108.35	85.30	59.93	97.40	28.72
Prob > χ^2	0.0000	0.0000	0.0000	0.0000	0.0259
Number of Observations	158	158	158	158	158

The z-statistics are the z-values adjusted for heteroskedasticity consistent standard errors.
* denotes significant at the 10% level. ** denotes significant at the 5% level. *** denotes significant at the 1% level.
(a) By natural logarithm of total assets

Using Pooled Ordinary Least Squares Estimation

Explanatory Variables	**Dependent Variables**				
	Total CER Quality, Q_{it}	Understandability, U_{it}	Relevance, $RELE_{it}$	Reliability, $RELI_{it}$	Comparability and Consistency, C_{it}
Constant	0.4380	7.7269**	2.1779	-15.9909	6.5241
	(0.02)	(2.27)	(0.30)	(-1.55)	(0.35)
$SIZE_{it}$[(a)]	1.7768	0.1040	0.1934	1.0355**	0.4438
	(1.63)	(0.76)	(0.69)	(2.55)	(0.58)
$INDUSTRY10_{it}$					
$INDManu_{it}$	-12.6254***	-0.4267	-1.2588	-2.0246	-8.9153***
	(-2.79)	(-0.97)	(-1.11)	(-1.49)	(-2.66)
$INDUtilities_{it}$	-9.7749*	-0.2661	-2.0273	-0.7192	-6.7624
	(-1.78)	(-0.54)	(-1.33)	(-0.58)	(-1.52)
$INDTrade_{it}$	2.9472	0.7909	-0.7555	-3.6025*	6.5143
	(0.59)	(1.39)	(-0.58)	(-1.92)	(1.62)
$INDTransport_{it}$	-7.5943	-0.7143	-2.8102***	-1.1722	-2.8975
	(-1.38)	(-1.23)	(-2.78)	(-0.67)	(-0.63)
$INDFinance_{it}$	-23.0707***	-0.5580	-3.2131**	-1.9053	-17.3943***
	(-3.81)	(-0.80)	(-2.37)	(-0.76)	(-3.23)
$INDRealEstate_{it}$	-14.6344**	-0.0454	-1.9414	-2.6659	-9.9817**
	(-2.51)	(-0.06)	(-1.04)	(-1.41)	(-2.48)
$INDOthers_{it}$	-16.6431**	1.4816**	-6.2556***	-1.6057	-10.2633*
	(-2.40)	(2.18)	(-3.06)	(-0.84)	(-1.90)
$COUNTRY_{it}$	9.4249***	1.0653***	1.3662*	5.6323***	1.3611
	(3.62)	(4.17)	(1.92)	(8.54)	(0.66)
$CROSS\ LISTING_{it}$	1.3720	0.4268*	-0.0671	-0.8330	1.8453
	(0.70)	(1.67)	(-0.12)	(-1.14)	(1.15)
$SALES\ OUTS_{it}$	-0.0301	-0.0090	-0.0324**	-0.0026	0.0139
	(-0.63)	(-1.48)	(-2.29)	(-0.15)	(0.38)
$FIN\ PERF_{it}$	0.0358***	-0.0006	0.0091*	0.0022	0.0252***
	(2.76)	(-0.53)	(1.84)	(0.62)	(2.66)
$EMISSIONS_{it}$	-1.8692***	-0.2041**	0.1676	0.0789	-1.9116***
	(-2.78)	(-2.37)	(0.78)	(0.29)	(-3.52)
$GRI\ APP_{it}$	5.0723***	0.1825	1.6049***	0.8496	2.4353
	(2.67)	(0.68)	(3.04)	(1.33)	(1.51)
$INDEX_{it}$	1.7709	0.0469	1.0035*	-0.4520	1.1725
	(0.63)	(0.16)	(1.70)	(-0.62)	(0.53)
$YEAR_{it}$	2.9107**	0.3069	0.3923	-0.1179	2.3294**
	(2.31)	(1.46)	(1.35)	(-0.34)	(2.06)
Adjusted R^2	0.401	0.304	0.262	0.438	0.281
F	21.51	8.93	5.86	11.57	36.13
Prob > F	0.0000	0.0000	0.0000	0.0000	0.0000
Number of Observations	158	158	158	158	158

The *t*-statistics are the *t*-values adjusted for heteroskedasticity consistent standard errors.
* denotes significant at the 10% level. ** denotes significant at the 5% level. *** denotes significant at the 1% level.
(a) By natural logarithm of total assets

Appendix 6: Regression Results by Year and Measure

Explanatory Variables	Dependent Variables									
	2005					2006				
	Total CER Quality, Q_j	Understandability, U_j	Relevance, $RELE_j$	Reliability, $RELI_j$	Comparability and Consistency, C_j[b)]	Total CER Quality, Q_j	Understandability, U_j	Relevance, $RELE_j$	Reliability, $RELI_j$	Comparability and Consistency, C_j[b)]
Constant	-5.7546	5.6018	4.9366	-11.4226		22.3750	11.3124*	2.2281	-21.4801	
	(-0.17)	(1.33)	(0.49)	(-1.06)		(0.50)	(1.73)	(0.20)	(-1.27)	
$SIZE_j$[a)]	2.3551*	0.2098	0.1421	0.8211*	0.2613	1.0319	-0.0169	0.1801	1.2767*	-0.1601
	(1.77)	(1.27)	(0.36)	(1.90)	(1.07)	(0.59)	(-0.06)	(0.41)	(1.95)	(-0.62)
$INDUSTRY10_j$										
$INDManu_j$	-17.3117***	-0.8955	-2.2871	-2.6946*	-3.0979***	-10.1290	-0.0280	-0.7909	-1.5319	-2.1394*
	(-3.43)	(-1.48)	(-1.57)	(-1.76)	(-3.10)	(-1.58)	(-0.04)	(-0.55)	(-0.79)	(-1.84)
$INDUtilities_j$	-12.6920	-0.5198	-1.9597	-1.9381	-2.2952	-8.1743	-0.0878	-2.4594	0.1646	-1.4368
	(-1.62)	(-0.55)	(-0.83)	(-0.92)	(-1.00)	(-1.12)	(-0.11)	(-1.25)	(0.08)	(-1.26)
$INDTrade_j$	1.5400	0.8437	-1.9452	-3.9024	16.0270***	2.3241	0.6190	-0.0449	-3.5854	15.9621***
	(0.24)	(0.98)	(-0.92)	(-1.40)	(9.43)	(0.32)	(0.60)	(-0.03)	(-1.37)	(9.47)
$INDTransport_j$	-10.9592	-0.6544	-3.4664**	-0.2951	-1.2662	-5.0416	-0.7789	-2.3966*	-1.8863	0.1411
	(-1.49)	(-0.91)	(-2.16)	(-0.15)	(-0.89)	(-0.61)	(-0.75)	(-1.77)	(-0.70)	(0.08)
$INDFinance_j$	-30.1671***	-0.6503	-5.0418**	-1.7942	-6.0629**	-16.7498*	-0.3551	-1.7663	-2.1254	-3.0067*
	(-3.50)	(-0.54)	(-2.43)	(-0.54)	(-2.38)	(-1.96)	(-0.35)	(-1.01)	(-0.64)	(-1.67)
$INDRealEstate_j$	-24.2980***	-0.7797	-2.7384	-3.3832	-4.9221***	-6.4940	0.5549	-1.2292	-1.9513	-1.2100
	(-2.72)	(-0.89)	(-0.79)	(-1.18)	(-3.43)	(-0.87)	(0.50)	(-0.70)	(-0.75)	(-0.85)
$INDOthers_j$						-10.2596	1.5491	-4.4268*	-1.6140	-1.0085
						(-0.98)	(1.31)	(-1.87)	(-0.55)	(-0.58)
$COUNTRY_j$	7.8953**	1.0780***	1.3639	5.6813***	-0.4401	10.3180***	1.0152**	1.1390	5.6332***	0.7137
	(2.38)	(3.04)	(1.24)	(6.97)	(-0.68)	(2.69)	(2.46)	(1.30)	(5.48)	(0.97)
$CROSS\ LISTING_j$	4.2152	0.4104	0.3237	-1.1028	1.4967**	-1.6849	0.4515	-0.4283	-0.7935	-0.3845
	(1.62)	(1.20)	(0.37)	(-1.18)	(2.53)	(-0.55)	(1.10)	(-0.59)	(-0.78)	(-0.62)
$SALES\ OUTS_j$	0.0240	-0.0048	-0.0171	0.0247	0.0185	-0.0702	-0.0133	-0.0425**	-0.0218	0.0008
	(0.32)	(-0.55)	(-0.64)	(1.02)	(1.06)	(-1.03)	(-1.30)	(-2.47)	(-0.78)	(0.07)
$FIN\ PERF_j$	0.0519**	-0.0003	0.0157*	0.0032	0.0145	0.0184	-0.0007	0.0037	0.0029	0.0147*
	(2.01)	(-0.13)	(1.73)	(0.11)	(1.39)	(0.36)	(-0.16)	(0.25)	(0.60)	(1.90)
$EMISSIONS_j$	-2.5481***	-0.2059*	-0.1047	-0.0176	-0.6113***	-1.5220	-0.2152	0.4034	0.1237	-0.4977**
	(-3.00)	(-1.93)	(-0.41)	(-0.06)	(-3.22)	(-1.52)	(-1.43)	(1.36)	(0.31)	(-2.48)
$GRI\ APP_j$	2.1944	0.1145	1.2155	0.3640	0.2308	8.5414***	0.2558	2.1380***	0.9937	1.3731**
	(0.72)	(0.32)	(1.19)	(0.37)	(0.38)	(2.96)	(0.48)	(2.97)	(1.20)	(2.24)
$INDEX_j$	1.7673	0.0797	0.9915	0.1948	0.0393	0.7198	-0.0535	1.2075	-0.9948	0.1952
	(0.59)	(0.18)	(1.37)	(0.21)	(0.06)	(0.18)	(-0.11)	(1.41)	(-0.91)	(0.27)
Adjusted R^2	0.436	0.269	0.164	0.440		0.358	0.252	0.285	0.392	
F	15.42	3.76	3.23	8.88		9.97	2.59	3.52	7.93	
Prob > F	0.0000	0.0002	0.0008	0.0000		0.0000	0.0041	0.0002	0.0000	
Pseudo R^2:										
McFadden's Adjusted R^2					0.095					0.032
Nagelkerke R^2					0.546					0.447
Log pseudolikelihood					-54.1514					-68.5411
Wald χ^2	15.42	3.76	3.23	8.88	738.84	9.97	2.59	3.52	7.93	761.18
Prob > χ^2	0.0000	0.0002	0.0008	0.0000	0.0000	0.0000	0.0041	0.0002	0.0000	0.0000
Number of Observations	75	75	75	75	75	83	83	83	83	83

The *t*-statistics are the *t*-values adjusted for heteroskedasticity consistent standard errors.
* denotes significant at the 10% level. ** denotes significant at the 5% level. *** denotes significant at the 1% level.
(a) By natural logarithm of total assets
(b) The results for comparability and consistency are derived from the ordered logistic regressions due to the fact that the *C* is ordinal. The *z*-statistics are the *z*-values adjusted for heteroskedasticity consistent standard errors. The exact threshold values for the ordered logit regressions are not provided by the estimations and hence, are not reported.